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AIR POLLUTION ABSTRACTS

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U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, N. C. 27711

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AIR POLLUTION ABSTRACTS

VOLUME 5, NO. 6 JUNE 1974

Prepared by
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

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16. ABSTRACT

This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 35440 - 36516.

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CONTENTS

Introduction 3
APTIC Publications 4
Recent Contract Awards 5
Subject Fields and Scope Notes 7
Abstract Bulletin 9
Subject Index SI-1
The terms that most closely describe the information presented in the documents are arranged alphabetically.
Author Index AI-1
Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given.

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The serial publications (journals, periodicals, etc.) being scanned number approximately 7,000. A list of approximately 1,000 of the most productive publications with the address of each publisher is available upon request.

As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work.

More than 1400 subject index terms are available for such searching ---more than those included in the subject index in each issue.

Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

Feedback from our users, including suggestions of articles, are always welcome.

APTIC Publications

Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:126, $0.65.

Air pollution Aspects of Emission Sources: Primary Copper Production - A Bibliography with Abstracts, June 1973 GPO No. EP 4.9:125, $0.70.

Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts, March 1973, GPO No. EP 4.9:121, $2.35.

Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:119, $0.90.

Mercury and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:114, $1.25.

Odors and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:113, $3.00.

Air Pollution Aspects of Emission Sources: Petroleum Refineries - A Bibliography With Abstracts, July 1972, GPO No. EP 4.9:110, $1.25.

Air Pollution Aspects of Emission Sources: Iron and Steel Mills - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:107, $1.00.

Air Pollution Aspects of Emission Sources: Boilers - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:105, $2.00.

Hydrochloric Acid and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:100, $0.55.

Chlorine and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:99, $0.55.

Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:96, $2.25.

Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:95, $0.50.

Air Pollution Aspects of Emission Sources: Sulfuric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:94, $0.65.

Air Pollution Aspects of Emission Sources: Nitric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:93, $0.45.

Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:92, $1.00.

Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes), March 1971, GPO No. EP 4.9:88, $6.25.

Beryllium and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:83, $0.40.

Asbestos and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:82, $0.50.

Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

Hydrocarbons and Air Pollution: An Annotated Bibliography (2 Volumes), October 1970, GPO No. HE 20.1309:75, $5.00.

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RECENT CONTRACT AWARDS

from the

Durham Contract Operations
Contracts Management Division, EPA

Contract No. 68-02-1296, RFP No. Du-74-B391 .... *$48,825*
OXIDANT PRECURSOR RELATIONS UNDER POLLUTANT TRANSPORT CONDITIONS.
Research Triangle Institute, P. O. Box 12194, Research Triangle Park, North Carolina 27709

Contract No. 68-02-1290, RFP No. Du-74-B444 .... *$82,400*
DEVELOPMENT OF GAS LASER SYSTEMS TO MEASURE TRACE GASES BY LONG PATH ABSORPTION TECHNIQUES.
General Electric Company, Ordnance Systems Electronics Systems Division, 100 Plastics Avenue, Pittsfield, Massachusetts 01201 (NOTE: Contract contains options in the amount of $51,150)

Contract No. 68-02-0761, Modification No. 3 .... *$50,000*
SCANNING ELECTRON MICROSCOPIC EXAMINATION OF THE IN VIVO EFFECTS OF AIR POLLUTANTS ON PULMONARY SYSTEMS.
IIT Research Institute, 10 West 35th Street, Chicago, Illinois 60616

Contract No. 68-02-1380, Task Order No. 3 .... *$33,000*
COMPLIANCE INFORMATION DEVELOPMENT AND PREPARATION FOR EPA REGION V - CHICAGO.
Engineering-Sciences, Inc., 7903 Westpark Drive, McLean, Virginia 22101

Contract No. 68-02-1280, RFP No. Du-74-B412 .... *$35,900*
COMPARATIVE TOXICITY OF OZONE AND NO2.
Duke Medical Center, Durham, North Carolina 27710 (NOTE: Contract contains options in the amount of $40,797)

Contract No. 68-02-1281, RFP No. Du-74-B388 .... *$44,000*
STUDY OF EFFECTS OF LOW LEVEL CARBON MONOXIDE EXPOSURE ON BLOOD LIPIDS AND COAGULATION PARAMETERS.
University of North Carolina, Chapel Hill, North Carolina 27514

Contract No. 68-02-1625, RFP No. Du-74-C723 .... *$73,068*
DISC OPERATING MINICOMPUTER SYSTEM.
Digital Equipment Corporation, Executive Park, 3700 Chapel Hill Boulevard, Durham, North Carolina 27707

Contract No. 68-02-0580, Modification No. 2 .... *$89,568*
MATHEMATICAL MODELING OF SIMULATED PHOTOCHEMICAL SMOG.
Systems Applications, Inc., 950 Northgate Drive, San Rafael, California 94903

Contract No. 68-02-1420, RFP No. Du-74-A056 .... *$49,700*
DEVELOPMENT OF AN OBJECTIVE SYSTEM FOR EVALUATION OF CONTROL AGENCY PROGRESS IN IMPLEMENTING THE STATE IMPLEMENTATION PLAN.
System Sciences, Inc., P. O. Box 2345, Chapel Hill, North Carolina 27514

Contract No. 68-02-1093, Modification No. 6 .... *$31,460*
FRACTIONAL EFFICIENCY OF EXISTING BAGHOUSES.
Enviro-Systems and Research, Inc., P. O. Box 658, Roanoke, Virginia 24004

Contract No. 68-02-1388, Task Order No. 3 .... *$30,000*
GUIDELINE FOR THE PREPARATION OF PARKING MANAGEMENT PLANS.
Alan M. Voorhees and Associates, Inc., Westgate Research Park, McLean, Virginia 22101

Contract No. 68-02-1375, Task Order No. 3 .... *$45,000*
FIELD CALIBRATION AND MAINTENANCE OF SMELTER STUDY MONITORING EQUIPMENT IN ARIZONA AND NEVADA.
PEDCo Environmental Specialists, Inc., Suite 13, Atkinson Square, Cincinnati, Ohio 45246

Contract No. 68-02-1278, RFP No. Du-74-B373 .... *$151,151*
THE PHYSICAL-CHEMICAL BEHAVIOR AND RESPIRATORY EFFECTS OF OXIDES OF SULFUR-AEROSOL MIXTURES.
University of Washington, Seattle, Washington 98195

Contract No. 68-02-1388, Task Order No. 4 .... *$65,000*
DESIGNATION AND ANALYSIS OF AQMAS IN THE STATES OF INDIANA, MINNESOTA, AND OHIO.
Alan M. Voorhees & Associates, Inc., Westgate Research Park, McLean, Virginia 22101

Contract No. 68-02-1375, Task Order No. 5 .... *$45,000*
EVALUATION OF THE CONTROLABILITY OF SPECIFIED POWER PLANTS.
PEDCo Environmental Specialists, Inc., Suite 13, Atkinson Square, Cincinnati, Ohio 45246

Contract No. 68-02-1417, RFP No. Du-74-A079 .... *$35,000*
METHODOLOGY FOR DETERMINATION OF EMISSION LINE SOURCES.
Washington University, St. Louis, Missouri 63130

Contract No. 68-02-1376, Task Order No. 9 .... *$30,000*
TRANSPORTATION CONTROL PLAN FOR THE CITIES OF NEW HAVEN, STANFORD, BRIDGEPORT, GREENWICH, AND NORWALK IN THE CONNECTICUT PORTIONS OF THE HARTFORD - NEW HAVEN - SPRINGFIELD AND NY-NJ-CT INTERSTATE AQCR's.
GCA Technology Division, Burlington Road, Bedford, Massachusetts 01730

Contract No. 68-02-1634, RFP No. Du-74-C773 .... *$49,982*
MODIFY WING 'J' OF THE NATIONAL ENVIRONMENTAL RESEARCH CENTER, RESEARCH TRIANGLE PARK, (DURHAM), NORTH CAROLINA TO ACCOMMODATE A KRYPTON-85 EXPOSURE FACILITY.
A. J. Bowling, Inc., Box 26564, Raleigh, North Carolina 27611

Contract No. 68-02-1287, RFP No. Du-74-B424 .... *$60,000*
REVIEWS ON THE TOXICITY OF METALS.
The Karolinska Institute, Department of Environmental Hygiene, S-10401, Stockholm 60 Sweden

Contract No. 68-02-1375, Task Order No. 4 .... *$50,000*

PLANT SURVEYS AND ENGINEERING ANALYSIS IN SUPPORT OF ENFORCEMENT PROCEEDINGS.

PEDCo-Environmental Specialists, Inc., Suite 13, Atkinson Square, Cincinnati, Ohio 45246

Contract No. 68-02-1228, Modification No. 1 .... *$49,906*

PERFECTION OF PREVIOUSLY DEVELOPED INSTRUMENTATION FOR THE COLLECTION AND ANALYSIS OF CARCINOGENIC VAPORS IN AMBIENT ATMOSPHERES.

Research Triangle Institute, P. O. Box 12194, Research Triangle Park, North Carolina 27709

Contract No. 68-02-1383, Task Order No. 4 .... *$28,000*

CALIBRATION AND MAINTENANCE OF AIR MONITORING SITES IN THE STATE OF NEW MEXICO.

Radian Corporation, 8500 Shoal Creek Road, Austin, Texas 78766

Contract No. 68-02-1378, Task Order No. 2 .... *$65,000*

EVALUATION OF COMPLIANCE SCHEDULES FOR SOURCES IN THE STATE OF LOUISIANA.

Pacific Environmental Services, Inc., 1930 14th Street, Santa Monica, California 90404

Solicitation No. Du-74-A181 .... *$40,932*

NON-PERSONAL TECHNICAL SERVICES (2,000 MANHOURS).

Research Triangle Institute, P. O. Box 12194, Research Triangle Park, North Carolina 27709 (NOTE: Contract contains options in the amount of $409,320 for 20,000 manhours)

Solicitation No. Du-74-A181 .... *$62,304*

NON-PERSONAL TECHNICAL SERVICES (2,000 MANHOURS).

Monsanto Research Corporation, Dayton Laboratory, 1515 Nicholas Road, Dayton, Ohio 45407 (NOTE: Contract contains options in the amount of $623,040 for 20,000 manhours)

Solicitation No. Du-74-A181 .... *$47,952*

NON-PERSONAL TECHNICAL SERVICES (2,000 MANHOURS).

Midwest Research Institute, 425 Volker Boulevard, Kansas City, Missouri 64110 (NOTE: Contract contains options in the amount of $479,520 for 20,000 manhours)

Solicitation No. Du-74-A181 .... *$49,792*

NON-PERSONAL TECHNICAL SERVICES (2,000 MANHOURS.

TRW Systems Group, TRW, Inc., One Space Park, Redondo Beach, California 90278 (NOTE: Contract contains options in the amount of $497,920 for 20,000 manhours)

Contract No. 68-02-1292, RFP No. Du-74-B416 .... *$57,986*

DETERMINE FIELD PERFORMANCE OF AN ON-SITE AND AN EXTRACTIVA SO2 MONITORING SYSTEM AND A PROTOTYPE H2SO4 MIST MONITORING SYSTEM AS APPLIED TO H2SO4 PLANT EMISSIONS.

Scott Research Laboratories, P. O. Box D-11, Plumsteadville, Pennsylvania 18949

Contract No. 68-02-1358, Modification No. 1 .... *$124,995*

SULFUR REMOVAL AND RECOVERY FROM FUEL GASES PRODUCED IN CLEAN ENERGY PRODUCTION FACILITIES.

Booz-Allen Applied Research Division, 4733 Bethesda Avenue, Bethesda Maryland 20014

Contract No. 68-02-1295, RFP No. Du-74-B474 .... *$54,353*

SAMPLING INTERFACE FOR QUANTITATIVE TRANSPORT OF AEROSOLS.

IIT Research Institute, 10 West 35 Street, Chicago, Illinois 60616

Solicitation No. Du-74-A001 .... *$23,036*

FIELD SAMPLING, TESTING, ANALYZING AND REPORTING OF AIR POLLUTION EMISSIONS (1,000 MANHOURS).

York Research Corporation, One Research Drive, Stamford, Connecticut 06904 (NOTE: Contract contains options in the amount of $1,013,584 for 44,000 additional manhours)

Solicitation No. Du-74-A001 .... *$27,740*

FIELD SAMPLING, TESTING, ANALYZING AND REPORTING OF AIR POLLUTION EMISSIONS (1,000 MANHOURS).

Scott Research Laboratories, Inc., Plumsteadville, Pennsylvania 18949 (NOTE: Contract contains options in the amount of $1,220 560 for 44,000 additional manhours)

Solicitation No. Du-74-A001 .... *$27,642*

FIELD SAMPLING, TESTING, ANALYZING AND REPORTING OF AIR POLLUTION EMISSIONS (1,000 MANHOURS).

Monsanto Research Corporation, 800 North Lindberg Boulevard, St. Louis, Missouri 63166 (NOTE: Contract contains options in the amount of $1,216,336 for 44,000 additional manhours)

Solicitation No. Du-74-A001 .... *$23,577*

FIELD SAMPLING, TESTING, ANALYZING AND REPORTING OF AIR POLLUTION EMISSIONS (1,000 MANHOURS).

Midwest Research Institute, 425 Volker Boulevard, Kansas City, Missouri 64110 (NOTE: Contract contains options in the amount of $1,037 432 for 44,000 additional manhours)

Solicitation No. Du-74-A001 .... *23,905*

FIELD SAMPLING, TESTING, ANALYZING AND REPORTING OF AIR POLLUTION EMISSIONS (1,000 MANHOURS).

Betz Environmental Engineers, Inc., One Plymouth Meeting Mall, Plymouth Meeting, Pennsylvania 19462 (NOTE: Contract contains options in the amount of 1,051,864 for 44,000 additional manhours)

Solicitation No. Du-74-A001 .... *$22,668*

FIELD SAMPLING, TESTING, ANALYZING AND REPORTING OF AIR POLLUTION EMISSIONS (1,000 MANHOURS).

George D. Clayton & Associates, 25711 Southfield Road, Southfield, Michigan 48075 (NOTE: Contract contains options in the amount of $997,480 for 44,000 additional manhours)

Solicitation No. Du-74-A001 .... *$21,482*

FIELD SAMPLING, TESTING, ANALYZING AND REPORTING OF AIR POLLUTION EMISSIONS (1,000 MANHOURS).

Environmental Science & Engineering, Inc., P. O. Box 13454, University Station, Gainesville, Florida 32601 (NOTE: Contract contains options in the amount of 945,296 for 44,000 additional manhours)

Solicitation No. Du-74-A001 .... *$29,590*
FIELD SAMPLING, TESTING, ANALYZING AND REPORTING OF AIR POLLUTION EMISSIONS (1,000 MANHOURS).

Battelle Columbus Laboratories, 505 King Avenue, Columbus, Ohio 43201 (NOTE: Contract contains options in the amount of $1,301,960 for 44,000 additional manhours)

Solicitation No. Du-74-A001 .... *$24,825*
FIELD SAMPLING, TESTING, ANALYZING AND REPORTING OF AIR POLLUTION EMISSIONS (1,000 MANHOURS).

Pacific Environmental Services, Inc., 1930 14th Street, Santa Monica, California 90404 (NOTE: Contract contains options in the amount of $1,092,344 for 44,000 additional manhours)

licitation No. Du-74-A001 *$25,069*

FIELD SAMPLING, TESTING, ANALYZING AND REPORTING OF AIR POLLUTION EMISSIONS (1,000 MANHOURS).

Engineering-Science, Inc., 7903 Westpark Drive, McLean, Virginia 22101 (NOTE: Contract contains options in the amount of $1,103,080 for 44,000 additional manhours)

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1974

35440 **APTIC NO. 59022**

Corbat, Jean-Pierre

AIR POLLUTION BY INTERNAL COMBUSTION ENGINES. *(Pollution de l air par les moteurs a combustion). Text in French. Bull. Tech. Suisse Romande (Lausanne), 110(1):2-20, 1974. 46 refs.*

Studies on the formation and effects of automotive exhaust emissions, and ways of abating exhaust emissions from spark-ignition engine and diesel vehicles are reviewed. Carbon monoxide is formed primarily from rich mixtures, and especially in spark-ignition engines. Unburned hydrocarbons are due to flame quenching at cold combustion chamber walls, and to the heterogeneous composition of the air-fuel mixture. The HC emission is lowest when the air excess coefficient is low. Nitric oxide is formed at high temperatures exceeding 1500 K, and in mixtures containing high oxygen concentrations. While black smoke is due to incomplete combustion, white smoke is composed of unburned HC, and blue smoke results from the combustion of motor oil. The use of high air excess coefficients, and of delayed injection are suitable for the reduction of CO emissions, and partly of the HC emissions, while the abatement of NO emission requires reduced air excess coefficient, delayed ignition, and increased surface-volume ratio. The expansion of public transportation, the reduction of the lead content in gasoline, the use of new sources of energy, such as liquefied petroleum gas, and of new engine and power plant designs, such as Wankel and Stirling engines, and of fuel cells, represent long-term contributions to automotive exhaust-generated air pollution abatement.

35441 **APTIC NO. 59291**

Forney, Albert J., William P. Haynes, Stanley J. Gasior, Glenn E. Johnson, and Joseph P. Strakey, Jr.

ANALYSIS OF TARS, CHARS, GASES, AND WATER FOUND IN EFFLUENTS FROM THE SYNTHANE PROCESS. *Pittsburgh Energy Research Center, Pittsburgh, Pa., Bureau of Mines Application of Improved Technology To Provide Clean Energy Program, Technical Progress Rept. 76, 12p., Jan. 1974. 4 refs.*

Results are presented from extensive analyses performed on the various effluents found in the Synthane coal-to-gas process. Large quantities of hydrogen, carbon monoxide, carbon dioxide, methane, and ethane are found in gasifier gases as well as a variety of trace components which include hydrogen sulfide, carbonyl sulfide, thiophene, methyl thiophene. dimethyl thiophene, benzene, toluene, C8 aromatics, sulfur dioxide, carbon disulfide, and methyl mercaptan. The sulfur compounds must be removed before methanation because of their poisoning effect on the nickel catalyst. Trace analyses of components in the gas have also revealed the presence of hydrogen cyanide and mercury. The low level of hydrogen cyanide indicates no serious problem; and mercury, although present in the gas from the gasifier, was not detected in the final product, i.e., high-Btu gas. Mercury and arsenic found in tars, if burned, would probably end up in the stack gas. Quantitative analysis results are given for tars, chars, gases, and water found in the process effluents.

35442 **APTIC NO. 59125**

Horio, Haruhiko

POLLUTION CONTROL IN MOTOR VEHICLE WORKS. *(Jidosha kojo no kogai taisaku). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 28(2):119-126, Feb. 1974. 2 refs.*

Pollution caused by automobile manufacturing operations is discussed. Dust from the forge shops, exhaust gas from the furnaces, hydrocarbons from the paint shops, and sulfur oxides and nitrogen oxides from the boilers contribute to air pollution. Odors are emitted from the shell machine and organic solvents. Emission criteria and control measures are discussed for each type and source of pollutant.

35443 **APTIC NO. 58472**

Kimmel, H. S., A. Perna, and R. B. Trattner

INFRARED STUDIES OF THE DECOMPOSITION PRODUCTS FROM A CONTROLLED SANITARY LANDFILL. *Appl. Spectry., 28(1):64-65, Jan./Feb. 1974. 4 refs.*

The biological activity of anaerobic and aerobic microorganisms in sanitary landfills causes the emission of various gases including carbon dioxide, carbon monoxide, methane, nitrogen, hydrogen, and oxygen. Conventional wet chemical methods cannot yield adequate analytical data on these gaseous products. Therefore, infrared spectroscopy was studied as a method of analyzing these products. The controlled sanitary landfill was studied at different temperatures using dry and wet soil. Spectra were obtained in the 4000-650/cm region using an infrared spectrophotometer. The infrared spectra indicated the same gases (water, CO2, ammonia, and CH4) from wet soil layers at 30, 40, and 50 C. The absorbances of CO2, CH4, and NH3 were measured at different times at 30, 40, and 50 C. Nitrous oxide was observed in the gases from dry soil decomposition at 30 C between the 17th and 24th days of decomposition. No ammonia was observed and CH4 was not observed until after the 70th day.

35444 **APTIC NO. 59127**

Miyao, Saisei and Yasuhiko Matsui

POLLUTION-FREE PULP MANUFACTURING METHOD. *(Mukogai parupu seizoho). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(1):39-42, Jan. 1974. 30 refs.*

Pulp manufacturing methods are discussed in relation to air pollution. Sulfite methods include the acid sulfite method, the bisulfite method, and the semichemical method. Previously less popular than the Kraft process because of the low recovery of the chemicals, new recovery methods are reviving interest in this method. The Tampella method includes a simple operation, a high recovery rate, and applicability to a wide range of sulfite processes. The direct oxidation method recovers high-purity chemicals, is applicable to Kraft pulping, and also the semichemical method. Kraft pulping recovers 95% of the chemicals used, and is therefore one of the most pollution-free methods.

35445 **APTIC NO. 59272**

O Mara, Michael M.

THE COMBUSTION PRODUCTS FROM SYNTHETIC AND NATURAL PRODUCTS -- PART 1: WOOD. *F. Fire Flammability, 5(1):34-53, Jan. 1974. 32 refs.*

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The major sources of life hazard in a fire are flame and superheated air, oxygen depletion, toxic gases, and smoke. Some of the combustion products may have a synergistic effect. A gas chromatograph was interfaced to an NBS Smoke Chamber to study the rate of generation of carbon monoxide and other gases during the burning of various materials. The effect of environmental oxygen concentration on the release of CO was also studied. The presence of other combustion and degradation products were qualitatively and semi-quantitatively determined. The combustion of cellulose produced carbon dioxide and carbon monoxide. Plywood production produced CO2 and CO in varying ratios; the CO2/CO ratio decreased then increased during exposure due to changing CO2 concentrations, since CO concentrations remained constant. Results for white oak were similar; the ratio of CO2/CO minimized and the concentration of smoke maximized early in the combustion process. Dry and humid white pine samples were burned; the moisture content of the wood affected both the CO formation and the development of smoke. As the progression was made from dry to wet pine, CO, CO2, and smoke generation decreased. During masonite (hardboard) combustion, the CO2/CO ratio minimized before smoke maximized. Combustion of masonite in reduced oxygen atmospheres showed CO2 production was more dependent on the concentration of oxygen than CO production. Above 10% oxygen, the amount of CO which is released and which escapes combustion remains constant. The different wood products generated CO at different rates. At 15 minutes, for example, plywood, white oak, white pine, and masonite combustion produced 3025, 2900, 2789, and 2040 ppm CO, respectively, which were 1.48, 1.51, 1.36, and 1.0 relative CO concentrations. The differences were due to combustion rates, weight loss, and the chemical composition of the particular wood. The generation of other combustion products such as methane, ethylene, propylene, methyl alcohol, acetaldehyde, acetic acid, and other products was also studied in the smoke chamber by a gas chromatograph and chromatographic column. The procedure for determining the combustion products is described.

35446 **APTIC NO. 59354**

Rosen, Gerald

FUNDAMENTAL THEORETICAL CONSIDERATIONS FOR AN AIR-SUSPENSION VORTEX FLOW INCINERATOR SYSTEM. *Chem. Eng. Sci., 29(1):97-104, Jan. 1974. 19 refs.*

The basic fluid dynamic and combustion theory underlying an air-suspension vortex flow incinerator system is presented, and the times required for drying, pyrolysis, and char burn-out of the fuel particles are mathematically derived. The flow is assumed steady and axially symmetric, and the Mach number is assumed small everywhere. Preliminary estimates for volumetric rates of production of gas and heat are also deduced from the theory. (Author abstract modified)

35447 **APTIC NO. 58795**

Southworth, Darlene

INTRODUCTION TO THE BIOLOGY OF AIRBORNE FUNGAL SPORES. *Ann. Allergy, 32(1):1-22, Jan. 1974. 30 refs. (Presented at the American College of Allergists, Annual Congress, 29th, Atlanta, Ga., April 12, 1973.)*

In all the major groups of fungi there are genera which produce airborne spores causing inhalant allergy. The spores are one to many-celled reproductive structures. Spores can be identified to genus or to a larger taxonomic group. A knowledge of air spore concentrations can aid in identifying the cause of allergic reactions. The major classes of fungi which produce airborne spores are described. These are zygomycetes, ascomycetes, deuteromycetes, and basidiomycetes. Spore sampling methods are discussed including a gravity slide method employing a Durham sampler, rotating impactor samplers such as the rotorod, and suction-impaction devices. After the samples are collected, they can be identified and counted microscopically or cultures and identified as colonies. Numerous keys are discussed for identification of airborne fungi based on characteristics of the spores, the conidiophores, and the colony for the identification of fungal colonies. For the identification of isolated spores, published material is generally inadequate or scattered. The methodology for setting up a sampling program is mentioned.

35448 **APTIC NO. 59145**

Stepniczka, Heinrich

THE INFLUENCE OF OXYGEN-ENRICHED ATMOSPHERES ON THE COMBUSTION BEHAVIOR OF POLYMERS. *J. Fire Flammability, 5(1):16-33, Jan. 1974. 22 refs.*

The influence of oxygen-enriched atmospheres on the combustion of untreated and flame-retarded polymers was studied using a modified version of the oxygen index method. Three aspects of polymer combustion were investigated: flame temperatures, rates of combustion, and smoke generation. The three polymers tested were polystyrene, acrylonitrile-butadiene-styrene terpolymer (ABS), and polyester. The combustion behavior of polymers was influenced significantly by the nature of the polymer, the addition of flame retardants to the substrate, and the concentration of oxygen in the atmosphere. The formation of char also depended on these factors plus the geometry and temperature of the polymer specimens. Addition-type polymers (such as polystyrene) generated little char regardless of specimen geometry or the oxygen concentration of the atmosphere. Condensation-type polymers (polyesters) formed a dense char. Flame retardants increased char formation on the two thermoplastic substrates. In the case of polyesters, the flame retardant produced only a minor increase in char formation. Combustion rates were generally lower and flame temperatures higher when a dense char was formed on the surface of the burning specimens. Less smoke was generated with higher oxygen concentrations in the atmosphere and with increasing char formation on the burning substrate.

35449 **APTIC NO. 59144**

Tsuchiya, Yoshio and Kikuo Sumi

SMOKE-PRODUCING CHARACTERISTICS OF MATERIALS. *J. Fire Flammability, 5(1):64-75, Jan. 1974. 8 refs.*

Various methods for determining the smoke-producing characteristics of materials are reviewed. These characteristics depend on both the material and the conditions under which smoke is produced. Two important factors are oxygen concentration and temperature. Most of the existing methods represent combustion under a limited set of environmental conditions that exist at actual fires. As a result, the validity of the determination is limited to the specific conditions defined by the test; different tests may produce conflicting results. The rate of smoke generation depends on two factors, one is the rate of combustion, the other, smoke generation coefficient or the amount of smoke produced from a unit weight of material. These two factors have different characteristics. A method to determine the smoke generation coefficient alone is needed to obtain data for a better understanding of smoke production. A theoretical and experimental method to meet this need was developed, and the smoke generation coefficient of various materials was determined under various conditions of temperatures and oxygen concentration in the atmosphere. The smoke generation coefficient of wood decreased with increasing temperature and decreasing oxygen in the atmosphere. Some of the polymers showed more smoke at higher temperature, and some showed the same degree of smoke production in air and in an oxygen-reduced atmosphere. (Author abstract modified)

35450 **APTIC NO. 59465**

Environmental Protection Agency, Washington, D. C., Hearing Panel

NATIONAL PUBLIC HEARINGS ON POWER PLANT COMPLIANCE WITH SULFUR OXIDE AIR POLLUTION REGULATIONS. (FINAL REPORT). *112p., Jan. 1974. 76 refs.*

An assessment was made by an Environmental Protection Agency hearing panel on the status of power plant compliance with sulfur dioxide air pollution emission limitations. Principle findings were as follows: flue gas desulfurization technology must be installed on large numbers of power plants if SOx emission requirements are to be met in the 1970 s since supplies of low-sulfur fuels are and will continue to be inadequate as a sole means of compliance with the emission limitations; many established SOx emission limitations will not be met by the mid-1975 compliance date of Most State implementation plans and will not be met at all unless the electric utility industry makes the necessary commitments to install flue gas desulfurization systems where needed; the electric utility industry has not aggressively sought out solutions to the problems they argue exist with flue gas desulfurization technology; the reliability of both throwaway-product and saleable product desulfurization systems has been sufficiently demonstrated on full scale units to warrant widespread commitments to such systems for SOx control at coal and oil-fired power plants; and the utility industry has generally lacked a real incentive to develop and install flue gas desulfurization technology.

1973

35451 **APTIC NO. 58888**

Ball, Gwendolyn, L. and E. A. Boettner

TOXIC GAS EVOLUTION FROM BURNING PLASTICS. *Polymer Preprints, 14(2):986-989, Aug. 1973. (Presented at the American Chemical Society, Chicago, Ill., Aug. 26-31, 1973.)*

Studies were performed on the toxic evolution of gaseous combustion products from the burning of plastics. Plastic polymers composed of only carbon and hydrogen or carbon, hydrogen, and oxygen formed carbon dioxide and water when completely combusted; whereas incomplete combustion resulted in production of carbon monoxide as the major toxicant plus gaseous and condensed hydrocarbon products. Plastics containing nitrogen as a heteroatom produced on complete combustion molecular nitrogen and small amounts of oxides of nitrogen, as well as carbon dioxide and water; incomplete combustion resulted in the production of hydrogen cyanide and other nitrogen compounds in addition to hydrocarbon gases. Nitrogen compounds were more sensitive than other combustion products to changes in combustion conditions; and generally the more incomplete the combustion, the more ammonia and cyanide that were formed. Plastics containing halogen or sulfur heteroatoms formed acid gases such as hydrogen chloride, hydrogen fluoride, and sulfur dioxide on complete combustion in addition to CO2 and water, while incomplete combustion resulted in the formation of organic halogen or sulfur compounds.

35452 **APTIC NO. 58939**

Baribault, R. P.

PRESENT PROBLEMS IN ALUMINUM MELTING PLANTS. *(Aktuelle Probleme der Aluminium-Schmelzhuetten). Text in German. Metall, 27(12): 1228-1231, 1973. (Presented at the Organization of European Aluminum Melting Plants, Annual Meeting, Munich, Sept. 21, 1973.)*

The quantity of coated aluminum products for canning and food wrapping purposes such as weather resistant coatings in the construction industry, and coating of kitchen apparatuses of trailers has more than quadrupled between 1962 and 1972 in the U. S. In Europe the increase was even higher. It rose from 57,000 tons in 1970 to 71,000 tons in 1971 to 100,000 tons in 1972. Two types of coated aluminum are of special importance to air pollution, because of fluoride and chloride pollution. Although their fraction is presently still low (about 1%) it is expected to increase. Presently the air pollution problem can be solved with wet collectors. Because of the corroding effect of the waste gases, the construction and material of the scrubber must be carefully selected. All waste water must be cleaned. A closed cycle would be the best solution, but presently no satisfactory method is yet in operation. Another problem is the high magnesium concentration of the alloys used for the manufacture of cans. A comparison of the capital investment costs for a new secondary coated aluminum melting plant with 20,000 tons annual production with and without facilities for cleaning the waste gases shows that $3 million are required for a plant with air pollutant cleaning devices and roughly $2.4 million without such devices.

35453 **APTIC NO. 58328**

Bartrop, T. H. C.

SOME ENVIRONMENTAL HEALTH PROBLEMS IN RURAL AREAS. *Royal Soc. Health J. (London), 93(1):3-7, 41, Feb. 1973. (Presented at the Royal Society of Health, Canadian Meeting.)*

The environmental health problems in the rural areas of England and Wales administered by the Rural District Councils are basically the same as those in the urban areas. Agriculture is the main industry in the rural areas. Agriculture has caused problems due to odors, noise, manure odor, eutrophication of lakes and rivers, poultry waste disposal, the use of chemical as pesticides and fertilizers, and water pollution. Waste disposal includes disposal of domestic refuse by sanitary landfill, incineration, and other methods; disposal of various types of litter by indiscriminate dumping; and sewage disposal. The demand for water for domestic and industrial use is continually rising, which increases the need for pure water. A seasonal air pollution problem arises from the burning of stubble after harvests. Industrial pollution can affect areas miles from its source, including rural areas. Several laws have been passed in Great Britain to protect the rural areas of pollution. Over the past 12 years, smoke and sulfur dioxide have decreased due to these efforts. Oil and noise pollution also occur in the rural areas.

35454 **APTIC NO. 58745**

Bascom, Roger C., Wen S. Chiu, and Ronald J. Padd

MEASUREMENT AND EVALUATION OF DIESEL SMOKE. *Preprint, Society of Automotive Engineers, New York, 17p., 1973. 11 refs. (Presented at the Society of Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1973.)*

The development of smoke measurement procedures and instruments has been one of the significant factors contributing to the reduction of smoke from diesel-powered trucks. There is a need, however, for better information on the relation between measurements and the appearance of the smoke plume, for improved smokemeters, and for common international test procedures. Studies of smoke plumes using jet theory, alumina tracers, and hydraulic analog techniques indicate that the plumes are sometimes unstable and subject to large-scale shedding in the region where free-plume smokemeters are located. This introduces a significant random variation into smoke measurements made in this location. A future test procedure based on smoke measurements made with a long-path (500 mm) in-line smokemeter during a dynamic cycle is suggested for consideration. (Author abstract)

35455 **APTIC NO. 58710**

Bolton, N. E., W. Fulkerson, W. S. Lyon, Jr., J. F. Emery, A. W. Andren, R. I. Van Hook, C. Feldman, L. D. Hulett, H. W. Dunn, and J. A. Carter

TRACE ELEMENT MEASUREMENTS AT THE COAL-FIRED ALLEN STEAM PLANT. *In: Electrical Energy and Its Environmental Impact. Progress Report -- June 30, 1973. Oak Ridge National Lab., National Science Foundation Interagency Agreement AEC 40-237-70, NSF AG 398, p. 52-60, July 1973. 9 refs.*

NTIS: ORNL-NSF-EP-55

The trace elements from coal combustion at the Tennessee Valley Authority Thomas A. Allen Steam Plant in Memphis were measured in the plant to obtain a mass balance and emission characteristis and in the environment to ascertain the fate of discharges of these elements. Trace analyses were made by neutron activation analysis, spark-source mass spectrometry, and flameless atomic absorption for mercury. Further measurements of cadmium, lead, and zinc were made on composite samples from two of the mass balance runs using isotope dilution spark-source mass spectroscopy. While 90% of the Zn and Pb occurred in fly ash, only 50% of the cadmium was in the fly ash, the remainder being present in the slag tank residue. Precipitator inlet flue gases were sampled for mercury using four impingers; approximately 58% of the Hg was in the flue gas; 10% of the Hg had previously been found in fly ash. During in-plant sampling, fly ash from the precipitator was collected for particle size determinations by an impinger; a cascade impactor was used to obtain data on particle size versus composition. Mean size was 1.6 micron by electron microscopy and 3.29 by the Coulter counter. Fly ash was subjected to seven key argon ion etching to determine differences in the surface and inside of the fly ash. Scanning electron microscopy done on six different fallout specimens showed spherical particles, which were probably fly ash. The cascade impactor samples were also analyzed by high sensitivity monochromatic x-ray fluorescence. Ratios of enrichment (equal to concentration of element in output/concentration of the same element in ashed coal) were studied. Atmospheric diffusion calculations around the plant showed the groung level particulate and mercury vapor concentrations as a function of meteorology and distance from the plant and the magnitude and pattern of fly ash deposition due to washout and fallout. These depositon values were then used to determine the maximum expected enrichment of toxic metals in the top layer of the soil. Future work and publications are described.

35456 **APTIC NO. 58504**

Bourke, W. L.

AIR POLLUTION FROM AIRCRAFT OPERATIONS AT SYDNEY (KINGSFORD-SMITH) AIRPORT. *Clean Air J. (Clean Air Soc. Australia New Zealand), 7(4):74-79, Nov. 1973. 14 refs.*

Aircraft landing and takeoff movements at Sydney s Kingsford-Smith Airport were analyzed to determine the average daily pollutants emitted by aircraft. All engine emissions below the mixing height of 3000 ft wery included as contributing towards a possible environmental impact. The landing and take-off cycle (LTO) considered consisted of start-up and idle, taxi-out to runway, take-off, climb, approach from 3000 ft to touchdown, land and taxi-in. Carbon monoxide, hydrocarbons, nitrogen oxides, sulfur dioxide, and particulates from various types of aircraft engines were determined for idle/taxi, approach, and take-off/climb-out operating modes. Other aircraft activities such as overhaul and testing were also considered as emission sources. Ground operations result in 1.64 tons of pollutants emitted as passenger terminals and 3.88 tons during taxiing. Airborne operations produce 2.48 tons in areas outside the airport boundary. Engine test running contributes a further 0.55 tons within the airport boundary. Several control methods, a comparison of emissions with other major airports, and future emission levels are discussed. The average daily pollutant emission of 8 tons/day has minimal impact on Sydney s regional air quality; it is only 1/500 of the daily automobile emissions. U. S. airports have eight to ten times the Sydney levels. Although Sydney airport pollution may increase slightly, this trend will be reversed as the proportion of wide-bodied and advanced technology commercial transports increases. Thus, the levels of pollution will not change significantly in the future.

35457 **APTIC NO. 58805**

Broome, D. and I. M. Khan

THE MECHANISMS OF SOOT RELEASE FROM COMBUSTION OF HYDROCARBON FUELS WITH PARTICULAR REFERENCE TO THE DIESEL ENGINE. *Lucas Eng. Rev., 6(2):46-56, Nov. 1973. 60 refs.*

A review of published work on fundamentals of soot formation mechanisms and soot release in diesel engines is presented, as revealed by laboratory studies. The experimental techniques, nature of carbon formed in flames, composition and physical properties of soot, and the effects of chemical and physical factors on soot release (hydrocarbo type, additives and diluents, equivalence ratio, temperature, pressure, turbulence, and pyrolysis of hydrocarbons), are discussed. The mechanisms of soot formation include nucleation, particle growth, and coagulation. Kinetics of formation and growth of soot particles, combustion and gasification of soot, soot release in the diesel engine, and characteristics of diesel combustion, are also discussed. The operation of high-speed direct-injection, quiescent direct-injection, Meurer combustion, and indirect-injection diesel combustion systems are reviewed. Various types of fuel can also affect soot formation.

35458 **APTIC NO. 59098**

Brushwell, William

PROBLEMS OF ENVIRONMENTAL PROTECTION IN THE PAINT INDUSTRY. *(Probleme des Umweltschutzes in der Lackindustrie). Text in German. Farbe Lack, 79(11):1072-1073, 1973. 16 refs.*

Problems of environmental protection, such as the limitation of and ban on the use of lead and mercury-containing paints, and solvent emission control in the paint and lacquer industry and in surface-coating shops in the U.S.A. are discussed. The Los Angeles County Rule 66 has imposed restrictions on the emission of solvents which are susceptible of being oxidized photochemically. The Federal Government has limited the emission of such hydrocarbons as well as of organic solvents to 3 lb/hr, or 15 lbs/day. The emissions must be abated to this level by incineration or adsorption on activated carbon. The State of New York has limited the use of solvents in paints and lacquers to 5% provided they contain olefin or cycloolefin groups, and to 8% for mixtures of aromatic compounds with 8 or more carbon atoms with the exception of xylene. Twenty percent are allowed for mixtures of xylene with ketones and toluene.

35459 **APTIC NO. 59013**

Buxmann, Joachim and Guenter Schwab

MODEL TESTS FOR LARGE LIGNITE-FIRED STEAM BOILERS. *(Modellversuche fuer grosse Braunkohle-Dampferzeuger). Text in German. VDI (Ver. Deut. Ingr.) Forschungsh. (Duesseldorf), no. 559:5-31, 1973. 17 refs.*

Model tests were done on steam generators. The flow patterns, heat transfer, and dust flow were theoretically modeled. Velocity of flue gases and dust load were derived and compared to those in a test boiler. Collection efficiencies of up to 50% were measured with a countercurrent dust separator where the gas flow was deflected by 360 to 720 deg. Large volume flows can be cleaned with the separator. For dust collection on the rear wall of a two-pass boiler, an additional small duct over the entire length of the wall with slots through which the dust particles can enter is provided. The collection efficiency of this method could be raised to about 50% by installation of a nose for accelerating the flow ahead of the deflection point.

35460 **APTIC NO. 59479**

Castleman, A. W , Jr., H. R. Munkelwitz, and B. Manowitz

CONTRIBUTION OF VOLCANIC SULPHUR COMPOUNDS TO THE STRATOSPHERIC AEROSOL LAYER. *Nature (London), 244(5415):345-346, Aug. 10, 1973. 5 refs.*

The contribution of volcanic sulfur compounds to the stratospheric aerosol layer was studied by comparing sulfur concentrations and 32S/34S isotopic ratios of selected stratospheric and tropospheric aerosol samples with the dates and locations of major volcanic eruptions. A clear correlation between sulfur concentration (expressed in micrograms of sulfate per standard cu m of filtered air) and volcanic activity was observed, with sulfate aerosol concentration in the Junge layer located south of the equator increasing two orders of magnitude within a year after the catastrophic 1963 eruption of Mount Agung. Positive del values of the stratospheric samples collected shortly after the eruptions undoubtedly resulted from a weighted average of the value for the injected tephra and the limited quantity of particles formed by the conversion of gases to particles in the rising plume along with pre-existing material in the stratosphere. A subsequent abrupt decline in del value with time indicated a depletion of the 34S isotope with respect to meteoritic sulfur for the aerosol particles being sampled, suggesting a fractionation of the isotopes of sulfur during exposure to a reactive chemical environment.

35461 **APTIC NO. 58677**

Dole, S. H. and R. A. Papetti

ENVIRONMENTAL FACTORS IN THE PRODUCTION AND USE OF ENERGY. *Rand Corp., Santa Monica, Calif., Rockefeller Foundation Grant RF-71015, Rept. R-992-RF, 88p., Jan. 1973. 175 refs.*

The major undesirable environmental effects of energy production and use are summarized. The control techniques and their costs are also presented. The pollutants carbon dioxide, carbon monoxide, sulfur oxides, nitrogen oxides, hydrocarbons, photochemical smog, particulates, water vapor, trace metals, radioactivity, thermal radiation, electromagnetic emissions, noise, and acid and mineral fallout are mentioned. Chemical-physical factors, radiological factors, and resource use are related to air, water, and land pollution. Control does not necessarily mean eliminating the undesirable pollutants entirely, but implies reducing them to a tolerable level by balancing the impacts against the benefits of development. Carbon monoxide and NOx emissions from fossil fuel combustion in mobile and stationary sources, noise pollution from mobile sources, acid mine drainage from coal mines, and surface damage to the land from strip mining are the most expensive effects to control. Factors controllable at intermediate cost include SOx from fuel combustion, particulates from coal combustion, thermal pollution of water by power plants, solid waste disposal from coal mining and combustion, disposal of radioactive solid wastes from nuclear power plant fuel processing, correction of land damage due to coal mining, and minimizing the aesthetic impact of power plants and transmission lines. Emission controls are discussed based on emission regulations (as in the case of NOx emission control from cars) or on estimates of the cost to eliminate the problem (as in lead in gasoline or thermal effluent discharges). Neither type of cost actually reflects the likely total costs that will be required from the energy sector. Substantial costs associated with controlling demand, switching to a different distribution of energy uses, or strict land use and transportation controls will be experienced. (Author summary modified)

35462 **APTIC NO. 59241**

Edgeworth, L.

CANADA S APPROACH TO ENVIRONMENTAL POLLUTION CONTROL FOR THE PULP AND PAPER INDUSTRY. *European Liaison Committee for Cellulose and Paper, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 103-112, (May 7-11.)*

Environmental air pollution control in Canada for the pulp and paper industry is discussed. The most important characteristic is that it is based on point source control and on best practical technology. Compliance schedules distinguish between the situation of the old and new plants. The standards are uniform across Canada. The Clean Air Act recognizes the direct authority of the provincial governments. National air quality objectives were recently established and define contaminates in various levels ranging from desirable through tolerable. The Act also allows for the regulation of the composition of fuels. Detailed inventories of specific contaminants are being compiled on a national scale.

35463 **APTIC NO. 59179**

Fields, H. H.

DEGASIFICATION THROUGH VERTICAL SHAFTS. *Bureau of Mines Information Circ., no. 8621:25-38, 1973. (Presented at the Bureau of Mines Industry Technology Transfer Seminar Symposium, Morgantown, W. Va., May 30-31, 1973.)*

Long holes were drilled into solid coal in very gassy virgin areas of the Pittsburgh coal bed in an effort to determine the effectiveness of the method for degasification of such areas prior to mining. Initial gas flows from seven holes drilled (average depth 618 ft) from the enlarged bottom of an 839 ft deep borehole were 79,000 to 257,000 cfd. The maximum in situ gas pressure measured from a point 190 ft in the coal bed was 203 psig, and initial water flow averaged 6.8 gpm/hole. Gas flow averaged 509,000 cfd from all holes after 190 days of degasification; and a total of 97,000,000 cu ft of methane was liberated (83% of the gas calculated to be in the affected area of coal). Concentrations for the constituents ethane, carbon dioxide, oxygen, nitrogen, and methane are given for analyses of two samples from total gas emission.

35464 **APTIC NO. 58928**

Forney, A. K.

ENGINE EXHAUST EMISSION LEVELS. *J. Aircraft, 10(12):716-719, Dec. 1973. 10 refs. (Presented at the AIAA 11th Aerospace Science Meeting, Washington, D. C., Jan. 10-12, 1973, Paper 73-98.)*

The exhaust emission products from a YJ93-GE-3 afterburning turbojet engine were measured under simulated flight conditions as a part of the Department of Transportation s Climatic Impact Assessment Program. Emission indices for the formation of carbon monoxide and total unburned hydrocarbons increased with increasing altitude at constant Mach number and decreased with increasing Mach number at constant altitude. The emission index for nitric oxide formation increased with increasing Mach number at constant altitude and decreased with increasing altitude at constant Mach number. (Author abstract modified)

35465 **APTIC NO. 58815**

Fujihara, Masahiro

PROBLEMS IN THE COUNTERMEASURES AGAINST SUSPENDED PARTICULATES THE PROBLEMS OF CONTROLLING AND ASSESSING AIR POLLUTION BY PARTICULATES. *(Funjin taisaku no mondaiten to kongo no kadai). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(11):1106-1114, Nov. 1973. 7 refs.*

Sources, control, and chemical composition of suspended particulates are reviewed. The average particulate concentration in the air of Tokyo in 1972 was about 110 micrograms/cu m. Major sources for suspended particulates were automobile exhausts, industrial emission sources, and natural sources. Although there are legal standards to regulate the total particulate concentration in the air, regulations should also be made to control specific pollutants within the particulates.

35466 **APTIC NO. 58369**

Fujii, Toru, Kiyoshi Imamura, Teruso Sawada, Ryo Nishi, Akio Danjo, Tetsuo Mamuro, Tadao Matsunami, Yatsuka Matsuda, and Akira Mizohata

STUDIES ON THE AIR POLLUTION BY EXHAUST GASES OF AIRCRAFT (2). *(Kokuki haigasu ni yoru taiki osen ni kansuru kenkyu (2): Kokuki enjin kara no haigasu seibun). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):516, 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 246.)*

Exhaust emission gases from two types of airplane engines were sampled by a nozzle probe, a sampling probe, and an exhaust temperature pressure probe. For various concentrations of jet nozzle cross-sections, a peripheral probe and a central sampling probe were used. For continuous automatic measurement of carbon monoxide, a nondispersive infrared analyzer was used; for the reading of nitric oxide, a flame ionization detector was used; for continuous reading of sulfur oxides, an electroconductivity meter was used. Aldehydes were captured by Mylar bags, and MBTH colorimetry was used to analyze them. Dusts were captured by membrane filter papers, and the total weight was measured; for metal content, radioactive analyses were given. For the Dart 10 engine, at 57% ppm, CO measurement was 95 ppm, total HC was 29 ppm, NO was 0.6 ppm, and SOx was 0.06; and for the JT8D-9 engine, at 56% rpm, CO was 84 ppm, THC 12.6 ppm, NO 0.5 ppm, and SOx was 0.24 ppm. The concentrations of sodium, aluminum, chromium, manganese, and iron were relatively high in airplane engine exhausts.

35467 **APTIC NO. 59155**

Gandois, S. and H. Roubert

RESULTS OF EIGHT YEARS IN THE CONTROL AND PREVENTION OF AIR POLLUTION AT THE LOIRE-SUR-RHONE POWER PLANT. *(Resultats de huit annees de controle et de prevention de la pollution atmospherique a la centrale de Loire-sur-Rhone). Text in French. Rev. Gen. Thermique (Paris), 12(142):1027-1042, Oct. 1973.*

Systematic measurements of the sulfur dioxide, fine dust concentrations and dust fall around the Loire-sur-Rhone thermal power plant are evaluated. The power plant, fired by both coal and fuel oil, is equipped with electrostatic precipitators for dust separation. Special fuel oil with reduced sulfur content is used during periods of inversion and under unfavorable meteorological conditions. The SO2, fine dust fall have been considerably reduced during the last 8 years, partly due to thy use of a high stack. The SO2 concentrations measured in a radius of 10 km around the power plant are 10 to 20 times lower than the allowable limits. The power plant has a negligible effect on the overall pollution level of its environment. It was not possible to establish correlation between the production rate of the power plant and the dust fall and the SO2 concentrations.

35468 **APTIC NO. 58684**

Gitis, E. B., F. I. Strigunok, and S. K. Solyanik

PREPARATION OF GRANULATED BARIUM CARBONATE OF INCREASED DENSITY. *(Polucheniye granulirovannogo karbonata bariya povyshennoy plotnosti). Text in Russian. Khim. Prom. (Moscow), 49(3):217-218, 1973. 4 refs.*

A new procedure for the preparation of granulated barium carbonate for glass manufacture is described. Compared with barium carbonate with low bulk density (0.7-0.9 g/cu cm), high-density barium carbonate has the advantage of improving glass quality, reducing the specific material expenditure, and abating air pollution in the glassworks premises. The high-density barium carbonate was obtained by solid-phase fritting at 700-750 C in the presence of alkali-earth metal ions in a rotary kiln for 100 min. The granulated material obtained had a specific gravity of 2.4 g/cu cm. The material entrainment from the rotary kiln ranged from 0.51 to 3.65 g/cu m before the cyclone.

35469 **APTIC NO. 58334**

Gotsu, Isamu, Hiroshi Kagawa, and Kojiro Shimanuki

INVESTIGATION OF LOCAL AIR POLLUTION IN CONCENTRATED AREA OF TILE MAKING INDUSTRY IN FUKUYAMA DISTRICT, KORIYAMA CITY. *(Koriyama-shi, Fukuyama chiku ni okeru kawara kojo chitai no taiki osen (SOx oyobi HF) chosa ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):498, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 228.)*

In 1970, unknown causes damaged the rice plants in the vicinity of tile factories in Koriyama. Similar damage in other areas suggested damages by hydrogen fluoride in the stack gas, and in August 1971, stack gas content was measured; 150 ppm of sulfur oxides and 20 ppm of hydrogen fluoride were detected. Seven of 14 tile plants installed stack gas treatment systems under the guidance of Koriyama city, and the systems began operation in January 1972. In April, stack gases were analyzed by the arsenazo III method and spectrophotometry; SOx concentration at the flue exit was 31-40 ppm and showed about 69.4-87% elimination rate; HF measurements were 12-17 ppm and elimination ranged between 98.7 and 96.2%. The SOx maximum was 3.68 ppm and was rather low, but the HF figures were relatively high compared with the figures of similar plants in other prefectures. The daily 8-hour average of environmental HF in the vicinity was 0.02-0.03 ppm and was higher than that of the entire prefecture. The causes may be the low smoke stack, low temperature of the stack gas, and the hilly topography, and poor dispersion. Also, combined pollution with the stack gases from the nearby brick and ceramic factories is suspected.

35470 **APTIC NO. 58357**

Hishida, Kazuo, Hisao Nihei, Urara Sano, Mutsuo Koizumi, Katsuya Nagata, and Kunio Yamakawa

EMISSION FACTORS FOR STATIONARY SOURCES, (PART I) BOILERS. *(Emisshon fakuta ni tsuite, kotei hasseigen (sono 1) boira). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):366, 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

Approximately 90% of all fixed emission sources in Tokyo are boilers and they number 9158 of the total 10,292 installations. Three power plants, five large-scale boilers (400-1500 sq m of thermal conductivity area), seven medium-size boilers (40-400 sq m) and four small boilers (less than 40 sq m) were selected and measurements of pollutants were taken. The methods used were: sulfur dioxide by infrared analyzer, nitrogen oxides by potentiometry and chemiluminescence, dusts by filter paper, carbon monoxide by gas chromatography, hydrocarbons by flame ionization detector and gas chromatography and aldehydes by MBTH. Emission factor coefficients were calculated by converting concentration measurements into weight per combustion unit. Power plants using coal had extremely high emission coefficients for SOx, NOx, and dusts; medium and small scale boilers utilizing fuel oil had high CO, HC, and formaldehyde emission coefficients.

35471 **APTIC NO. 58547**

Hishida, Kazuo, Hisao Nihei, Urara Sano, Mutsuo Koizumi, Katsuya Nagata, Kunio Yamakawa, and Shuzo Nakao

SOOT AND SMOKE EMITTING FACILITIES EXCEPT BOILERS. *(Emisshon fakuta ni tsuite kotei hasseigen (sono 2), sono ta no gaien shisetsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):367, 1973. (Presented at the Japan. Society Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 109.)*

Three basic furnaces, 16 metal-smelting furnaces, 9 metal-heating furnaces, 6 dryers, 6 kilns, 4 electric furnaces, and 12 incinerators in Tokyo were investigated as fixed sources of air pollutants, and measurements were taken for sulfur dioxide, nitrogen dioxide, dusts, carbon monoxide, hydrocarbons, and formaldehydes. Emission coefficients, fuel types and flue gas treatment systems were examined. High concentrations of pollutants and their sources were: SO2 by Pb-melting cupola, 80.5 ppm; NO2 by metal-heating furnaces, 4.40 ppm; dusts by incinerators 3.45 ppm; CO by incinerators and 35.5 ppm, HC4 and HCHO by ABS dryer and 6.05 ppm and 0.073 ppm respectively.

35472 **APTIC NO. 58912**

Hishida, Kazuo, Hisao Nihei, Kenji Ikeda, and Takeshi Saito

EMISSION FACTORS FOR MOBILE SOURCES. (PART 3) DIESEL ENGINE VEHICLES. *(Emisshon fakuta ni tsuite ido hasseigen (sono 3), dizeru jidosha ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):340, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

Automobile exhaust emission coefficients of diesel engine vehicles were obtained. From the fuel consumption rate of various car types, the emission factor per km of driving was obtained. Emissions by combustion chamber types, the load amount, and the ratio of the number of cars were obtained. By multiplying each coefficient, an average emission quantity was obtained. Emission factors for carbon monoxide, hydrocarbons, nitrogen oxides, RCHO, sulfur dioxides, dusts, and fuel consumption for various types of combustion chambers, for 13 and diesel truck modes, and for buses and trucks are presented in tables.

35473 **APTIC NO. 58564**

Hoshika, Yasuyuki and Suzushi Kadowaki

IDENTIFICATON OF EVOLVED COMPONENT FROM ABS COPOLYMER BY G. C. *(ABS Jushi (genryo oyobi seizo kotei) kara hassei suru kihatsusei seibun no gasu kuromatogurafu bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):271, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 26.)*

The components of odor-producing elements in the acrylonitrile, butadiene, and styrene polymer blending process were identified. Infrared spectrometry showed the characteristic absorptions of acrylonitrile, butadiene, and styrene. The material was kept in a polyvinyl chloride bag and in a refrigerator for 2 1/2 months and a head space gas chromatography reading was taken at room temperature. Heating increased the styrene odor (threshold 0.07-0.1 ppm), but almost no acrylonitrle odor was detected. In a plant, the odor of acrylonitrile styrene in the extrusion process can exceed several thousands ppm; but the use of a platinum catalyst odor eliminator (more than 99.9% elimination) can control it to several ppm.

35474 **APTIC NO. 58592**

Inoue, Tsutomu, Makoto Tani, Shutaro Taketani, Koyu Tachikawa, Etsuji Chujo, Shunichi Higawa, and Yasushi Tahara

AIR POLLUTION CONTROL IN KONOHANA-KU AND ITS NEIGHBORING AREA. *(Osaka-shi Konohana-ku shuhen tokubetsu taisaku ni tsuite (II)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):507, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 237.)*

The Konohana District in Osaka is the center of heavy chemical industries in the western coastal region. It contains about 400 plants, including major power plants, gas supply companies, iron and steel industries, and mechanical and chemical engineering firms. The fuel consumption of the district is 27% of the total fuel consumption of the city, and six companies and nine plants consume 97% of the total fuel consumption of the district. The environmental sulfur oxides concentration of 1971 was 0.065 ppm, and in November 1971, 199 plants including those of neighboring districts were investigated; 61 plants were requested to convert fuel or install stack gas desulfurization systems. As a result, the sulfur weight percentage in the fuel dropped from 0.87% in 1971 to 0.4% in 1972 among the nine major plants, and from 0.95% to 0.33% among the power plants. The 1972 environmental SOx average was 0.047 ppm.

35475 **APTIC NO. 58443**

Ishiguro, Tatsukichi, Yoshiharu Iwasaki, Hisashi Fukushima, Harukichi Onozuka, and Toshio Odaira

METHOD FOR MEASURING POLLUTANTS IN EXHAUST GAS FROM INCINERATION FOR CITY WASTES. *(Seiso kojo ni okeru haigasu osenshitsu no jittai ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):595, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 316.)*

Pollutants in the combustion gases at a sanitation plant in Tokyo were investigated. Hydrogen chloride, sulfur dioxide, nitrogen oxide, dusts, carbon dioxide, hydrogen cyanide, and hydrocarbons were measured. The results are presented in tables and graphs. Electroconductivity and silver nitrate methods were used for measuring HCl. The previous difficulty in measuring HCl by electroconductivity seemed to have been caused by the sampling method. The sampling apparatus must be cleaned thoroughly. The HCl maximum was 1030 ppm, minimum 330 ppm, and the average 850 ppm. The maximum for SO2 concentration was 84 ppm, minimum 16 ppm, and average 37 ppm. The maximum for NOx was 210 ppm, minimum 75, and the average about 157 ppm. The dust average was 26 mg N cu m. The correlation between SO2 and CO2 was 0.82; but sometimes the SO2 concentration increased regardless of combustion conditions.

35476 **APTIC NO. 59300**

Junod, A. and P. Lehmann

RECOMMENDATIONS FOR THE UNIFORM SIZING OF CHIMNEYS BASED ON SIMPLE METEOROLOGICAL STATISTICS AND LONG-RANGE NORMS. *(Ein Vorschlag zur einheitlichen Dimensionierung von Schornsteinen mittels einfacher meteorologischer Statistiken und Langzeitnormen). Text in German. V.D.I. (Ver. Deut. Ingr.) Ber., no. 200:63-72, 1973.*

A uniform method for determining the maximum allowable increase in ambient concentration due to a new stack is presented. Methods are examined for obtaining long-range time averages of ambient conditions near point sources from meteorological statistics in order to include long-range standards for air quality, and the dependency of the loading factor on time averages is also considered. The fact that additional sources may be placed in the vicinity of a chimney at some subsequent time can be taken into consideration by arranging for a new chimney to produce only a part of the maximum allowable ambient concentration; and whatever the equation or method used for determining the stack height, a value for the maximum allowable increase in ambient concentration due to the new chimney must be included.

35477 **APTIC NO. 58402**

Kawasaki, Gunji, Masao Yamasaki, Yasutaka Hosono, Hisao Arakawa, Sachio Yumoto, and Masami Imai

ON FLUORIDES IN EXHAUST GAS (I). *(Fusso kagobutsu hasseigen chosa ni tsuite - sono 1 - chitsugyo kankei kojo hasseigen chosa). Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):361, 1973. (Presented at the Japan. Society Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 105.)*

The emission gases from nine ceramic plants producing tiles and bricks in Toyama prefecture were analyzed. Much fluoride, hydrogen chloride, and other chlorine gases were found in the flue gas from the bittern additive, glaze, and the tile materials. Fluoride emissions ranged from 9 to 174 mg/N cu m, and Cl gas from 7 to 516 ppm. At one of the plants, an elimination system was installed for flue gas, and the F content in the flue gas decreased from 131 to 0-1.1 mg, Cl gas from 90 to zero. The environmental concentration of F at 70 m from the plant reduced from 320-410 micrograms F/1000 sq m/month to 0.32, and at 200 m, from 45-56 micrograms to 0-32. Fluorides and HCl gas began to form at 600 C, and reached peaks at 900 for HCl and at 950 C for F.

35478 **APTIC NO. 58591**

Kawasaki, Gunji, Isao Miyamoto, Minoru Ishizaka, Yukio Inada, and Hidekazu Okumura

ON ODOR POLLUTION OF SULFUR COMPOUNDS AND ITS DETERMINATION METHOD. *(Io kagobutsu ni yoru akushu no jittai chosa oyobi sono sokuteiho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):436, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 174.)*

At a Kraft Pulp plant in Toyama, odor emissions, odor borderlines, and the environment of peripheral areas with regard to hydrogen sulfide, methyl mercaptans, and dimethyl sulfide were examined. Regulation standards and regulation areas were designated in Toyama prefecture based on the findings. The measurements were taken at two recovery boiler stacks, the borderlines of the plant grounds, and distances of 500 m, 835 m, 1000 m, and 1500 m from the stacks. Concentrations of H_2S ranged from undetectable to 114 ppm at the stacks, up to 0.091 at the grounds limits, and up to 0.039 ppm in the environment. Methyl mercaptans ranged from undetectable to 3.2 ppm, and dimethyl sulfide ranged from undetectable to 3.8 ppm. The fluctuation of H_2S concentration at the recovery boilers was great. There was no relationship between the concentrations of the recovery boiler and environment.

35479 **APTIC NO. 58437**

Kawase, Zenichi, Masugi Arai, and Yasuo Yoshida

STUDIES ON MEASUREMENT OF PCB IN EXHAUST GASES. *(Haigasuchu no PCB no sokutei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):598, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 319.)*

Polychlorinated biphenyls (PCB) in the combustion gas of domestic refuse were measured at two incinerators. First, the measurement method was devised by examination of absorbent and capturing rates. The tests using several organic solvents showed that 10% glycerine solution yielded the best result. For a capturing device, between a flask and an absorption jar, a tube packed with glass wool was installed. The capturing rate of the tube was 83%, and together with the absorption jar, the total capturing rate was 96%, and in some cases 97.9%. This method was then applied to the combustion gas of incinerators. The PCB content in the gas was small, with the maximum measurement of 0.30 microgram/N cu m, which was captured in the tube; there was no trace in the absorbent.

35480 **APTIC NO. 58542**

Kitagawa, Tetsuzo

CAUSES FOR PHOTOCHEMICAL SMOG FORMATION-- EXAMINATION OF AIRPLANE ENGINE EXHAUSTS. *(Kokagaku sumoggu no hassei genin ni tsuite-- kokuki haigasu no kento). Text in Japanese. Kagaku to Kogyo (Tokyo) (Chem. Chem. Ind.), 26(9):542-544, 1973. 3 refs.*

An automobile and an airplane emit exhaust gases with similar nonsaturated hydrocarbons, but the fuel consumption of one car is 6 l/hr and that of one jet (DC-8) with four turbofan engines is 25,800 l/hr at the time of takeoff. If jet aircrafts leave the Tokyo International Airport every four minutes, the total nitrogen oxide emission per hour is 1600 kg, which is equivalent to 15,000-20,000 automobile emissions of NO_x. The amounts of air traffic at Tokyo and Osaka airports are 460 and 400 per day respectively. Therefore, the upper skies of Tokyo Bay, Sagami Bay, Ise Bay, Osaka Bay and the Inland Sea are probably polluted by heavy accumulations of plane exhaust gases. Often on quiet summer days, a temperature inversion layer of about 200-300 m appears between 300-1500 m above Tokyo. The layer is a stable layer current, in contrast to the turbulence in the lower layer. An airplane leaving Tokyo necessarily passes through this inversion layer at the angle of 14 deg, emitting a mass gas current of 1200 m long and 50 m in diam. The angle of approach is 3 deg and therefore the current of exhaust gas is 6000 m in the inversion layer. These gases stay in the belt or form lumps and float down in the direction of wind. The concentration of NO_x and HC in undiluted air mass is high, between 50 and 100 ppm. The turbine engine air ratio is high at 60-80 and nitric oxide oxidizes into nitrogen dioxide quickly. The intense ultraviolet radiation in the sky also contributes to the formation of oxidants, organic acids, aldehydes, nitrate, and nitrite esters. Airplane exhaust gases are an important source of photochemical smog.

35481 **APTIC NO. 58375**

Kitagawa, Yoshio, Akira Furukawa, Akio Sueda, Hiroshi Ryoken, and Masatoshi Ito

INVESTIGATION OF ODOROUS AIR POLLUTION FROM FACTORY OF VULCANIZATION ACCELERATOR. *(Karyu sokushinzai seizo kojo no akushu ni kansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):379, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 119.)*

The odor emitted from the vulcanization accelerator manufacturing plant in the Hirao township in Yamaguchi prefecture has created many complaints. The measurements of hydrogen sulfide and carbon disulfide were taken by flame photometric detector and gas chromatography, and the odor intensity was indicated in six gradings; 171 families in the plant vicinity were given a questionnaire. The correlation between odor intensity and components concentration, and regression formulas were formulated. The flue gas contained an average of 460,000 ppb of H_2S and 160,000 ppb of CS_2. Within the plant, H_2S average was 140 ppb. and CS_2 was 55 ppb; the odor intensity was 3.6. On the borderline of the plant grounds, H_2S was 64 ppb and CS_2 was 29 ppb, with the odor intensity of 2.6. In the lee of the wind 400 m from the stack, the average reading of H_2S was 7.8 ppb and CS_2, 6.6 ppb; the odor intensity was 2.1.

35482 **APTIC NO. 58584**

Kitagawa, Yoshi, Akira Furukawa, Akio Sueda, Hiroshi Ryoken, and Masatoshi Ito

INVESTIGATION OF ODOROUS AIR POLLUTANTS EMITTED FROM FISH-MEAL PLANTS. (Gyochokotsu shori kojo no akushu ni kansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):380, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 120.)

Odor emitted by a fishmeal plant in Nagato was investigated for five days in August 1973. Measurements were taken for ammonia, trimethylamine (TMA), methyl mercaptan (MM), dimethylsulfide (DMS), and hydrogen sulfide (H2S), which are designated as bad odor elements by the Odor Control Law. Ammonia was analyzed by idophenol and the others by the methods designated by the Japanese Industrial Standards. Questionnaires and interviews were given to 146 families in the area. The measurement of TMA was extremely high at the dryer exhaust exit at 23,000 ppb, and NH3 and also high at 47 ppm. The drying process, rather than the boiling or compressing processes, seemed to produce much DMS. Especially high correlations were noted with TMA and MM. The correlations between odor intensity and TMA was 0.86, odor and MM, 0.73, TMA with MM, 0.07, with H2S, 0.66, MM with H2S was 0.81.

35483 **APTIC NO. 58358**

Kitayama, Hiroshi, Hideo Hayashi, Sataro Iwasaki, Tadashi Fujimura, Tomohiko Miyano, Hideaki Murayama, and Tomihiro Mizohata

EFFECT OF COMBUSTION CONDITIONS ON NITROGEN OXIDES FORMATION FURNACES (II). *(Nenshoro yori hassei suru chisso sankabutsu oyobi nensho joken no eikyo (II)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):350, Oct. 1973. (Presented at the Japan. Soc Air Pollution, Annual Meeting 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 94.)*

The nitric oxide emission quantity from a glass melting tank furnace was investigated in order to solve the problem of technical difficulty in reducing the fuel consumption under a photochemical smog warning. A glass melting tank furnace with a capacity of 170 tons/day of original material, with a 1300 l/hr burner with steam atomizer was investigated. A glass melting furnace requires a high air ratio (1.55) and high preheated air (1100 C), and usually emits approximately 850-1000 ppm of nitric oxide. After varying combustion conditions, it was found that by the damper opening adjustment and air ratio decrease to about 1.40, approximately 55.3% of NO could be reduced, down to 480 ppm. When air ratio was 1.23, NO was reduced 94.7% and the concentration was 45 ppm. It was found that hydrocarbon emissions double the amount of normal emissions at the time of burner switch.

35484 **APTIC NO. 58828**

Kobayakawa, Takashi, Hiromichi Kamiyama, Tsugio Ogawa, and Kasho En

TOTAL AIR POLLUTANT EMISSION FROM VEHICLES INTO FUTURE. *(Jidosha haishutsu gasu no teigen ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):329, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 74.)*

A projected total of the number of automobiles in Japan for the year 2005, the total emission quantity of pollutants, and the effects obtained by the present abatement plan on the fluctuation of emission quantity were culculated. The figures for carbon monoxide, hydrocarbons, nitrogen oxides, and the total emissions per year were obtained. The emission coefficient will increase with the installation of emission gas purification systems; but on the other hand, the decrease of driving distances and the decrease of fuel consumption by smaller model cars will presumably keep the emission coefficient and fuel consumption at the same level once maximum production growth is reached. With the maximum increase in the number of automobiles, the amount of hydrocarbons will be 1,000,000 and 1,500,000 tons a year between 1975 and 2005. Judging from the total emission quantity, the presently planned abatement program should suffice for a good result for the next 25 to 30 years. However, the abatement method for each pollutant should be studied.

35485 **APTIC NO. 58544**

Kobayashi, Shuichi, Hirofumi Matsushita, Hiroshi Osaka, and Kiyoshi Morimura

MEASUREMENT OF ODOROUS POLLUTANTS DRYER EMISSIONS AND STUDY ON ITS DEODORIZATION. *(Toso yakitsuke kansoro no dasshu taisaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):374, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 114.)*

Pollutants and odor emitted from coating plants are great problems; 40-70% of solvents in paints are emitted in the air, and the emission of phenol and formaldehydes are also very highly concentrated. Depending on the type of paints, the aldehyde concentration in flue gas ranges from 3.1 to 23 ppm. At the present time, adsorption, catalytic oxidation, and direct combustion are available but none of them is satisfactory. The most used method by Japanese medium and small industries is the direct combustion method, which consists of preheating, combustion, and flue gas emission; the running cost is rather high. The maximum combustion temperature ranges 720-820 C, combustion time more than 0.5 sec., and the gas-flame mixture is controlled. By this method, solvent components are almost completely eliminated, but aldehydes are not. For combustion temperatures 680-760 C, nitrogen oxide emission is 50-65 ppm, and this method is far from satisfactory.

35486 **APTIC NO. 58747**

Krause, S. R., D. F. Merrion, and G. L. Green

EFFECT OF INLET AIR HUMIDITY AND TEMPERATURE ON DIESEL EXHAUST EMISSIONS. *Preprint, Society of Automotive Engineers, New York, 7p., 1973. 8 refs. (Presented at the Society of Automotive Engineers International Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1973.)*

The effects of humidity and temperature on hydrocarbons, carbon monoxide, carbon dioxide, nitrogen oxides, and smoke emissions were determined for six different manufacturers engines run over a 13-mode cycle. Equations are recommended to correct NOx emissions back to standard conditions of 75 grains of water/lb dry air and 85 F. Humidity had no significant effect on other emissions. Temperature substantially affected the HC, CO, and smoke emissions of some engines. Correlations between measurements of NO/NOx by nondispersive infrared spectrometry, dispersive ultraviolet spectrometry, and chemiluminescence are compared. An equation is recommended to correlate two commercial smoke measurement techniques. (Author abstract)

35487 **APTIC NO. 58869**

Laster, L. L.

ATMOSPHERIC EMISSIONS FROM THE ASPHALT INDUSTRY. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., ROAP 21AXM10, Program Element 1AB015, EPA-650/2-73-046, 42p., Dec. 1973. 9 refs.*

NTIS: PB 227372/AS

The air pollution problem of the asphalt industry (hot-mix asphalt plants and roofing manufacture) is discussed -- emphasizing particulate emissions. Industrial processes, types and sources of pollutants, and current and required controls are reviewed. Particulates are the principal emissions, and sulfur oxides, nitrogen oxides, odors, and hydrocarbons are emissions of minor importance. Approximately 200,000 metric tons of these pollutants (except for odor, per se) were emitted in the U. S. in 1968, with substantial control only for the particulates. In spite of developed controls, the industry still has air pollution problems. Pollutants contribute to dense and foggy fume and cause most of the public s complaints. Particulates can be controlled by wet or dry methods (or a combination of the two) by fabric filters, or by baghouses. Emissions of sulfur oxides, nitrogen oxides, and hydrocarbons are not significant qualitatively, but each contributes to the odor and smog problems and should be controlled. Electrostatic precipitators are not usually considered for asphalt plants because of their initial cost and rather high volume. Control methods are available for the principal pollutant, particulates; however, as in many other industries, available controls are often not being installed. Definitions are given of terms relating to asphalt pavements and surface treatments and of terms relating to asphaltic materials. (Author abstract modified)

35488 **APTIC NO. 59256**

Laster, L. L.

ATMOSPHERIC EMISSIONS FROM THE PETROLEUM REFINING INDUSTRY. (FINAL REPORT). *National Environmental Research Center, Research Triangle Park, N. C., Control Systems Lab., Program Element 1A2013, EPA-650/2-73-017, 56p., Aug. 1973. 35 refs.*

NTIS: PB-225 040/5 AS

The air pollution problems of the petroleum refining industry are summarized with emphasis on gaseous emissions. THe principal emissions from refining operations are sulfur oxides, nitrogen oxides, hydrocarbons, particulates, carbon monoxide, and odors. The estimated emissions of these pollutants (except odor) at the 262 refineries operating in the United States in 1969 totaled 7.04 million tons with substantial control exercised only in the case of hydrocarbons, particulates, and CO. In accordance with guidelines proposed by the U. S. Environmental Protection Agency for emissions from refinery operations, oil companies, working in conjunction with trade organizations and equipment manufacturers,, have employed interim controls in many cases and have developed processes and devices for at least reducing all pollutants from refineries. (Author abstract modified)

35489 **APTIC NO. 58932**

Libby, Paul A.

TECHNICAL EVALUATION REPORT ON AGARD TECHNICAL MEETING ON ATMOSPHERIC POLLUTION BY AIRCRAFT ENGINES. *AGARD Conf. Proc., no. 125:1-3, 1973. (Presented at the Propulsion and Energetics Panel, 41st Meeting, Regents Park, England, April 9-13, 1973, AGARD-AR-63.)*

There appear to be two general environmental problems associated with aircraft operations: one concerns the effect of the operation of a large fleet of supersonic aircraft in the stratosphere on the various balances prevailing in the earth s upper atmosphere, while the other relates to low altitude smoke pollution close to airports. The nature of the first problem focuses on the possible impact of SST operations in the 1985-1995 time frame on the ozone balance in the stratosphere and has generated opposing viewpoints concerning its likelihood. Some researchers contend that the ozone balance in the upper atmosphere involves a delicate equilibrium among chemical, radiative, and meteorological effects and that the perturbation of this equilibrium by emissions from the engines of a large fleet of SST s may have a profound effect on the global weather. The second problem has also generated controversy concerning the extent of the pollution associated with aircraft engines compared to the pollution associated with automobiles, auxiliary equipment, and fuel handling in the terminal area.

35490 **APTIC NO. 59257**

Magee, E. M., H. J. Hall, and G. M. Varga, Jr.

POTENTIAL POLLUTANTS IN FOSSIL FUELS. (FINAL REPORT). *Esso Research and Engineering Co., Linden, N. J., U. S. Environmental Protection Agency Contract 68-02-0629, Program Element 1A2013, EPA-R2-73-249, GRU. 2DJ.73., 300p., June 1973. 110 refs.*

Data obtained from the literature on sulfur, nitrogen, and other potential pollutants in fossil fuels in the United States are presented. The data are categorized according to the location of the raw fuels, and are analyzed for geographic effects on composition. Good data and useful correlations with source locations are available for petroleum sulfur, nitrogen, and nickel/vanadium, but not for other potential pollutants. A large amount of data is presented for trace elements in coal and nearly complete data are available for sulfur. Additional data include: spectrochemical analyses of coal ash for trace elements, rare elements in coal, mercury in coal, determination of arsenic in coal, colorimetric determination of beryllium, chemical analysis for germanium and gallium in head samples of fly ash and flue dust, spectrochemical analysis of coal ash, and method for determination of fluorine in coal.

35491 **APTIC NO. 58994**

Malschaert, F. P.

TWENTY-SIXTH INTERNATIONAL CONGRESS ON WATER STUDY, HELD IN LIEGE, GAND AND BRUSSELS, MAY 21-25, 1973. WAR ON AUTOMOTIVE EXHAUST LEAD EMISSIONS. *(XXVIes Journees internationales d Etude des Eaux Liege, Gand et Bruxelles, du 21 au 25 mai 1973. La lutte contre le plomb dans les emissions des moteurs des automobiles). Text in French. Tribune CEBEDEAU (Centre Belge Etude Doc. Eaux), 26(360):412-417, Nov. 1973.*

Problems and possibilities of the abatement of automotive exhaust lead emissions are discussed. The rate of retention of Pb circulation in the gastrointestinal system is 5-10%, or 13-25 micrograms/day. Assuming the average Pb concentration in the air to be 3 micrograms/cu m, the quantity inhaled daily amounts of 60-75 micrograms of which 10 to 50% are retained in the organism. The normal Pb concentrations in the blood and in the urine are 40 and 80 micrograms/l, respectively, while 120 and 250 micrograms/l are regarded as dangerous. Lead emissions from automobiles can be controlled by the use of particle traps, e.g., alumina-covered iron or steel wire in a pot for leaded gasoline, or by the use of no lead gasoline which, however, is more expensive than leaded gasoline. Reduced compression ratio, increased specific fuel consumption, increase in the price and weight of the motor, and reduction of the unit capacity would result from the reduction of the research octane number due to the partial or total removal of Pb from gasoline.

35492 **APTIC NO. 58853**

Mammarella, L., A. Biondi, and A. L. Santi

AIR POLLUTION DUE TO LEAD (ASSESSMENT, STATE OF THE ART, PERSPECTIVES). *(L inquinamento atmosferico da piombo (accertamento, situazione, prospettive)). Text in Italian. Ingegnere (Milan), 48(7-8):404-414, Aug. 1973. 25 refs.*

General problems of automotive exhaust lead emissions, and possibilities of their abatement are surveyed. The increase in the atmospheric lead concentrations observed during the past decades, is closely related to the increase in the traffic density in general, and to the use of leaded gasoline, in particular. Organic lead compounds such as lead alkyls are more active biologically than inorganic compounds. Lead compounds are absorbed by the human organism mostly via the gastrointestinal tract, but also via the respiratory tract. Some 60 to 80% of the total lead in gasoline is emitted in the form of inorganic lead compounds, and some 60% of all exhaust gas lead emissions are in the form of particles smaller than 1 micron.

The dispersion of automotive exhaust lead emissions is limited vertically to a height of 10-15 m, and to several hundred meters horizontally, along highways and streets. The blood lead levels in urban dwellers exceed those measured in suburbanites and rural inhabitants, while the blood lead levels in subjects living 70 to 100 m off highways are also considerably higher than those measured in other urban dwellers. Differential air sampling according to Mammarella s method is especially suitable for the determination of respirable lead concentrations. Gasolines currently used for automobiles contain from 0.3 to 0.6 g of lead alkyl/l. There are presently no feasible methods and substances for the subsitution of lead in gasoline available. The development of new fuels, such as oxygen and hydrogen in argon, and of new engine designs permitting the use of lead-free or low-lead gasoline, are regarded as the basic, real possibilities to abate lead contamination of the environment.

35493 **APTIC NO. 58911**

Mapperley, B. W. and P. R. Sewell

THE EVOLUTION OF TOXIC GASES FROM HEATED POLYMERS--I. HYDROGEN CYANIDE AND CARBON MONOXIDE. *Eur. Polym. J., 9(12):1255-1264, Dec. 1973. 8 refs.*

Various polymeric materials (polyurethane foams, gelatine, wool, acrylic, and nylon) commonly found in domestic situations were subjected to temperatures ranging from 700-1200 C; and the evolution of hydrogen cyanide and carbon monoxide was examined in air and in nitrogen. Hydrogen cyanide was evolved from all the nitrogenous materials examined, the amounts increasing with the nitrogen content of the sample. Most of the materials gave a similar conversion of nitrogen into hydrogen cyanide for a given temperature, although there was a tendency for the acrylic fiber to give a higher conversion. Nylon gave a higher conversion at a slightly lower temperature. Maximum evolution of hydrogen cyanide was usually in the 900-1000 C range; the amount evolved showed little dependence on the presence of oxygen. There was an indication of a decrease in the HCN formation at 1200 C in the presence of air, possibly owing to oxidation of carbon monoxide. All of the samples examined produced carbon monoxide, greater amounts being produced at higher temperatures; results were not greatly affected by the type of atmosphere. The newer synthetic materials appeared to be similar to traditional materials with regard to the evolution of these toxic gases.

35494 **APTIC NO. 59282**

Masuda, Nobuo and Takahiko Suzuki

COMBUSTION CHARACTERISTICS OF RECIRCULATING BURNER. *(Junkan nenshoshiki bana no nensho tokusei (dainiho)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):348, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

The amount of nitric oxide in the combustion gas of the Daido caloric burner, a recirculating burner introduced last year, was examined changing the fuels and combustion conditions. The caloric burner was not developed as a low NOx burner in particular, but as an all-purpose burner. With fuel oil, the maximum NO formation was 75 ppm, and with kerosene, the maximum was 63 ppm. Under the same conditions, the less the molecular weight of fuel compositions, the less NO formation was generated. The temperature of combustion, and also in an actual plant, the temperature in the furnace were influential in the formation of NO. The use of city gas or LNG will decrease NO to 35-40 ppm.

35495 **APTIC NO. 58514**

Matsushita, Shukaku, Keiichi Arashidani, and Michiko Koyano

DETERMINATION OF CARCINOGENIC HYDROCARBONS IN SOIL. *(Tsuchi ni fukumareru hatsugansei tanka suiso no sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):452, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 186.)*

Carcinogenic hydrocarbons in the mud and sand on the roads were analyzed. A simple method of analysis was devised and samples from various busy city streets were analyzed. The samples were sifted in a 28-mesh sift; 10-15 g of this material was taken and put in a Soxhlet extracter for 8 hrs; the benzene extract liquid was then filtered, condensed by reduced pressure, and a given amount was separated by two-layer primary thin layer chromatography, and the separated spots under the ultraviolet irradiation were scraped and DMSO (3 ml) was added. The polynuclear aromatic hydrocarbons in the extract were identified and measured by fluorescence spectrophotometry. In spite of the simple procedure, 10 kinds of PAH was identified and errors were within 5%. The dirt sample from a busy intersection of Kawasaki contained 0.94-22.1 ppm of benzo(a)pyrene. The asphalt content of BaP is 2.3 ppm; therefore, the high BaP content in the dirt may be regarded pollution from automobile exhaust and factory stack gas. Other BaP measurements were 0.15-0.22 ppm in the sample from the Kyoto Station; 1.34 ppm from the sample at the exit of the Nagoya Station; 2.33 ppm in the sample from the Osaka Station Northern exit; and 1.91 ppm from a sample from an Osaka subway entrance.

35496 **APTIC NO. 59156**

Meyer, C. and G. de Soete

FORMATION OF NITROGEN OXIDES IN FURNACES AND INDUSTRIAL BOILERS. *(Formation des oxydes d azote dans les fours et les chaudieres industriels). Text in French. Rev. Gen. Thermique (Paris), 12(142):913-928, Oct. 1973. 23 refs.*

The mechanism of the nitrogen oxide formation in furnaces and industrial and utility boilers is described, and methods for the reduction of nitrogen oxide emissions from such combustion equipment are proposed. If nitric oxide is formed from the molecular nitrogen of the air, such as in natural gas firings, the rate of reaction of the NO formation is relatively low, and is dependent essentially on the combustion temperature. If NO is formed from the organic nitrogen in the fuel, such as in coal firings, the reaction rate is much higher, and is essentially determined by the oxygen concentration in the reaction zone. The rate of NO formation from the fuel nitrogen content increases with the increase in the nitrogen content in the fuel and in thy oxygen concentration, and decreases with a lowering of the temperature. Flue gas recycling, the injection of water or steam into the combustion zone, and especially the use of two-stage combustion equipment, possibly in combination with a fluidized bed, are the basic possibilities to reduce NO formation in large-capacity combustion equipment.

35497 **APTIC NO. 58933**

Mizoguchi, Tsuigio, Hideyuki Nomoto, Yasuhiro Konawa, Masaaki Naito, and Mikiko Naito

ESTIMATION OF CO CONCENTRATION STREET CANYON. *(Doronai ni okeru jidosha haishutsu gasu ni yoru CO nodo no yosoku moderu ni tsuite (daisanpo)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):555, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 280.)*

For an accurate estimate of the carbon monoxide emission by automobiles on highways, emission quantities by operation mode were taken by a chassis dynamometer, and based on the data, mathematical formulas, and a computer, average CO concentrations on main roads of the Osaka area were obtained. The number of automobiles and operation modes of average cars were checked on the main roads. In each case, idling, acceleration, constant, the ratio of speed decrease, and speeding conditions and emission quantities were investigated. The CO emission quantity per car was measured by road and per time belt. As computer input data, the road direction, width, building heights on both sides of the road, meteorological conditions, and traffic amount for each of 15 roads of Osaka were compiled. Formulas were obtained for pollution levels, emission intensity, conversion coefficient, wind speed, road angle, and building heights in the direction of the wind and lea. The average CO levels for five arteries of Osaka were 10.1, 22.8, 13, 5.2, and 16.6 ppm.

35498 **APTIC NO. 58844**

Mizukami, Yukihiro

THE POINTS OF PLANNING AND OPERATING RESULTS OF THE DISTRICT HEATING OF MAIN STREETS IN SAPPORO CITY. *(Chiiki danbo keikaku to sono unten hisseki). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(12):1237-1244, Dec. 1973. 5 refs.*

A steam plant which supplies central heating to the northern part of Sapporo is described. Dust is collected by a multicyclone and is limited to less than 0.2 g/N cu m. Stack height is 90 m. A small public park surrounding the physical plant acts as a green belt. Pressurized steam is piped to individual consumers. Construction costs were approximately $23,985.000. The average price per 1000 kcal was approximately 1 cent. The project will be completed in 1974 and sulfur oxides emissions will be greatly reduced.

35499 **APTIC NO. 58583**

Mizutani, Hiroo, Akio Kamiya, Masaru Kitase, Taiki Aoyama, and Eiichi Ito

ODOR POLLUTION RESEARCH IN NAGOYA CITY. *(Nagoya-shi ni okeru akushu chosa ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):381, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 121.)*

Odor measurements were taken at various emission sources in Nagoya on borderlines of the grounds. A total of 488 operations were investigated: 74 dairy stock farms, six cattle farms, 55 pig farms, 283 chicken farms, one plover farm, five chicken excreta drying plants, five fertilizer plants, 10 fish meal plants, 32 refuse treatment plants, and 17 sewage treatment plants. Detectable at chicken farms were ammonia and methyl mercaptans; at pig farms, ammonia, hydrogen sulfide, and CH3SH; at sewage treatment plants, H2S; at refuse treatment plants, NH3 and H2S; at human waste treatment plants, NH3, H2S and trimethylamine, and at fishmeal plants, N2S, CH3SH, and (CH3)3N. Correlations should not be obtained between odor intensity and measurements. Some seemed to have multiplication effects. The pyridine pylozolone method was found unreliable because of adsorption problem.

35500 **APTIC NO. 58341**

Nakano, Michio, Yasuhiro Hayashi, Hiroshi Takeuchi, Taizo Nakano, and Kaihei Takeda

CONTINUOUS MONITORING SYSTEMS OF AIR POLLUTANTS FROM MAJOR SOURCES IN OSAKA CITY (REPORT 2). *(Taiki osen hasseigen no joji kanshi kiko ni tsuite (dai ni-ho), kokagaku osen to kojo nenryoyu sakugen no jisshi jokyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):406, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 143.) 59226 Noel, Thomas M. TEXTILE AIR POLLUTION PROBLEMS AS SEEN BY A STATE CONTROL AGENCY. Preprint, Rhode Island State Dept. of Health, 8p., 1973.*

Air pollution problems are reviewed for the textile dyeing and finishing industry in Rhode Island. Major pollutant sources in the industry are tenter frames and other high-temperature dryers, and the pollutants emitted include residual spinning and knitting oils, carriers, and other organics volatilized from the fabric and exhausted to the outside air as an odorous blue smoke. The problem is considered primarily a serious nuisance in Rhode Island. Identification of the sources has been by complaints and observation by field inspectors, while abatement action has been a result of enforcement of visible emission and nuisance regulations and the requirement of installation permits. Reduction of emissions by process change including dry cleaning and pressurized dyeing has been popular because economic benefit has been realized. All recently installed exhaust control devices have been of the high-efficiency liquid scrubbing type. Incineration is generally considered the most efficient method, although industry finds the cost too high. (Author abstract modified)

35501 **APTIC NO. 58304**

Shirasawa, Tadao, Zenichi Kawase, Ichiro Muraoka, and Kazuko Mizukami

AIR POLLUTION PRODUCED BY CUPOLA FURNACES (II) - ENVIRONMENTAL SURVEY. *(Kyupora ni yoru taiki osen ni tsuite, dai-2-ho, kaykyo chosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):359, 1973. (Presented at Japan. Society for Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 103.)*

Cupola furnaces as pollutant emission sources were investigated in Kawaguchi. Suspended particulates were captured by hi-vol and lo-vol samplers, settling particles by dust jars, and heavy metal analyses were done by chlorine-hydrogen peroxide extraction and atomic absorption spectrophotometry; iron, zinc, lead, manganese, copper, chromium, nickel, and cadmium were analyzed. Between cupola complex area and peripheral areas, there are notable concentration differences in Mn, Fe, Zn, and Pb. The dust and metal cumulative weight percentages show logarithmically regular distribution patterns, and 50% of dusts are 1 micron size; 50% of Fe are approximately 4 micron; and 50% value of Pb are 0.4 micron order. The ratios of Mn, Ni and Fe were great in the cupola areas. Dusts emitted from cupolas contained great ratios of Fe (10-25%) and Mn (1-15%).

35502 **APTIC NO. 58898**

Singh, A. N.

PREVENTIVE ENVIRONMENTAL HYGIENE WITH SPECIAL REFERENCE TO INDUSTRIES--PART I. *Indian J. Ind. Med., 19(3):112-128, July 1973.*

A general review is presented concerning environmental pollution, its relationship to the growth of civilization and technological progress, and the growing magnitude of industrial environmental pollution in India. Data are presented from surveys of silicosis and pulmonary tuberculosis incidence for refractory brick factories, ceramic factories, and mica mines and factories in Bihar (India). The amount of emissions and regulations controlling them in these industries are discussed.

35503 **APTIC NO. 58330**

Smythe, R. J. and F. W. Karasek

THE ANALYSIS OF DIESEL EXHAUSTS FOR LOW-MOLECULAR-WEIGHT CARBONYL COMPOUNDS. *J. Chromatog., 86(1):228-231, 1973. 13 refs.*

Diesel engine exhausts were analyzed for low molecular weight carbonyl compounds. The exhaust gases from a 1972 Mercedes Benz 220 diesel passenger car were condensed to form heterogeneous aqueous solutions of diesel soot and aqueous solutions of the organic combustion products. The observed qualitative and quantitative composition of the exhausts with respect to low molecular weight carbonyl compounds in g/kl for three runs are acrolein, 0.0008, 0.0008, and 0.0005; formaldehyde, 0.02, 0.03, and 0.02; and crotonaldehyde, 0.00002, 0.0032, and 0.0003. The reason for the variations in the crotonaldehyde concentration is unknown.

35504 **APTIC NO. 58555**

Suzuki, Ryota, Masayuki Ito, Akira Moritani, and Naoki Saito

DETERMINATION OF PCB IN DUST AND STACK GAS FROM CITY WASTES INCINERATORS. *(Toshi gomi shokyakuro kara haishutsu sareru dasuto, kaibun oyobi haigasuchu no PCB bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):599, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 320.)*

Total polychlorinated biphenyls emitted by urban refuse incinerators were measured. The measurements were taken from samples of incinerator cinders, dusts from dust collectors, ashes, and flue gases washed down by a scrubber. Flue gas PCB were measured by n-hexane absorption and the glycerine coating phloridyl column absorption method. The total PCB was calculated by the peak method and chlorination method; the errors in the values were within 20%. The PCB content was greater in the dusts, cinders, and ashes than in flue gas. Dusts collected by electrostatic precipitators had much greater figures than other types of collectors. An incinerator with the treatment capacity of 80 ton/day which emits flue gas 44,000 N cum/hr, dusts 90 kg/day, cinders 10 ton/day, emits 5.15 g of PCB daily in flue gas, 0.05 g in dusts, 0.30 g in cinder and the total PCB is 5.50 g.

35505 **APTIC NO. 58768**

Todavchich, Z. I.

ON THE EFFECT OF TEMPERATURE RISE AND RATE OF COKING ON THE SULFUR CONTENT IN COKES OBTAINED FROM DONETS COALS. *(O vliyanii uvelicheniya temperatury i skorosti koksovaniya na sernistost koksa iz donetskikh ugley). Text in Russian. Koks i Khim., no. 2:15-18, 1973. 5 refs.*

The effect of temperature increase and rate of coking on the sulfur content in cokes from three different Donets coals of various degrees of metamorphism was studied. The degree of the metamorphism and the properties of the organic components had marked effects on the sulfur content in the solid residues only when the coals were heated to reach a plastic state (350-550 C). The thermal stability of the organic sulfur compounds was lowest in gas coals. An increase in the rate of heat-up from 2.5 C/min to 10 C/min resulted in a more or less marked decrease in the residual sulfur content in the coke. The sulfur content in cokes obtained from charges with high proportion of gas coals can be reduced by increasing the rate of coking and elevating the final temperature of the coke before discharge from the furnace.

35506 **APTIC NO. 58934**

Urano, Kohei and Kenji Nakamura

THE BEHAVIORS OF HEAVY METALS IN THE HEATING RECOVERY PROCESS OF SEWAGE TREATMENT ACTIVATED CARBON. *(Gesui shori kasseitan no kanetsu saiseiji ni okeru jukinzoku no kyodo). Text in Japanese. Gesuido Kyokai-shi (J. Japan Sewage Works Assoc.), 10(115):19-22, Dec. 1973. 6 refs.*

The possibility of a secondary air pollution during the heating reactivating process of particulate activated carbon utilized in the tertiary tests of various sewage treatment plants was examined by measuring the heavy metal content released from the carbon. Six kinds of activated carbons used at various treatment plants were dried, packed in quartz tubes, and heated at various temperatures between 200 and 960 C for 10 to 80 min. The thermal speed was 60 C/min. After heating, the carbon was drastically cooled in 25% nitrogen; 100 ml of nitric acid was added and boiled for 2 hr. The carbon was filtered, diluted by distillate water to 100 ml, and atomic absorption spectrophotometry was applied for measuring copper, chromium, manganese, lead, zinc, and mercury. The activated carbon utilized in sewage treatment contained (per 1 kg of dry material), 800-1700 mg of Cu, 150-1800 mg of Cr, 15-80 mg of Mn, 5-20 mg of Pb, 500-1700 of Zn, and 0-5 mg of Hg. Since the activated carbon contained almost no heavy metals before treating sewage, it was assumed that accumulation of traceable metals in the sewage adsorbed on carbon was considerable. When regenerating carbon by heating, Hg compounds at 200 C or more, and Zn and Pb compounds at 800 C or higher are gasified. Since part of these metals will be released in the flue gas, it is necessary to install a flue gas treatment system for regenerating used activated carbon.

35507 **APTIC NO. 59243**

Westerberg, E. N. and N. C. Berg

AIR POLLUTION: ITS RELATION TO ENERGY PRODUCTION AND RECOVERY OPERATIONS IN PULP AND PAPER MILLS. *European Liaison Committee for Cellulose and Paper, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 633-645, 691-697. 68 refs. (May 7-11.)*

The relationship of air pollution to energy production and recovery operations in the pulp and paper mills of Finland is discussed. Air pollution problems are closely related to the energy generating systems. With increased emphasis on air pollution abatement and with increasing fuel and power costs, the industry is expected to continue its ecological leadership position by focusing attention to the energy aspects. Tables are included to show emissions from different fuels when generating 1 Gcal net heat in steam and the supply of energy demand and its relation to air pollution. The most sulfur dioxide pollution comes from production of newsprint, followed by sack paper, and bleached kraft pulp.

35508 **APTIC NO. 58827**

Yoshizumi, Kunio, Koichi Inoue, Yasuo Iida, and Toshio Odaira

THE RELATION BETWEEN THE RUNNING CONDITON AND EXHAUST GAS. *(Soko jotai to haiki gasu sosei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):332, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan. Nov. 6-8, 1973. Paper 77.)*

The measurements of automotive exhaust emissions by simulated driving of eight modes and four modes were compared, and the relationships between the car speed, acceleration, speed reduction, and exhaust gas concentrations were examined. The measurements were taken by the direct concentration method and the constant volume sampler (CVS) method, using appropriate analyzers, and the data were analyzed by a mini computer. All pollutant (carbon monoxide, hydrocarbons, and nitrogen oxides) concentrations were higher for the eight-mode operation compared to the four-mode operations. The reason might be that the ratio of acceleration for the eight-mode driving is higher and the maximum is also higher, at 50 kg/hr. Similar results were obtained for both direct concentration measurements and the CVS measurements. The NOx drastically increased with the increase of car speed and the rate of acceleration. The comparisons of measurements and the relationships are presented in graphs.

35509 **APTIC NO. 59103**

Yoshizumi, Kunio, Koichi Inoue, Takeharu Watanabe, and Toshio Odaira

THE CHARACTER OF EMISSIONS FROM SORTS OF ENGINES. ALDEHYDE EMISSIONS. *(Kakushu enjin kara no haiki gasu haishutsu tokusei - arudehitorui no haishutsu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):333, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 78.)*

The qualitative and quantitative measurements of aldehydes in automotive engine exhausts were examined to see the compositions, their relationships with the fuel and driving conditions, and the characteristics of emissions from the rotary engine. Regular city gasoline, isooctane, i-octane-n-heptene mixture (90:10), toluene, and gasoline plus 20% methanol were used on idling and 40 km/hr driving conditions and checked by a dynamometer. Sampling was directly taken by an impinger with a 2,4 DNP hydrazine saturation solution, and the precipitation formation was separated and dissolved in dichloromethane. The solution was analyzed by gas chromatography. The concentration of aldehydes emitted when driving at 40 km/hr was several times higher than that from idling driving. Formaldehyde was found in high concentration in all fuels. A high concentration of aromatic aldehyde C6H5CHO was found in toluene, but not in isooctane and normal heptane. This incidates that C6H5CHO is not formed from paraffin fuels but is easily formed from toluene by oxidation. All elements of aldehydes increased when regular gasoline was mixed with 20% of methanol.

35510 APTIC NO. 58324

Tokyo Metropolitan Government (Japan), Toshima District Dept. of Construction Pollution

THE 1971 AUTOMATIC RECORDER MEASUREMENTS OF AIR POLLUTION (NITROGEN OXIDES, WIND DIRECTION, VELOCITY): SEPTEMBER 1, 1971 THROUGH MARCH 31, 1972. *(Showa 46-nendo taiki osen jido kirokukei sokutei kekka, Chisso sankabutsu, fuko, fusoku). Text in Japanese. 77p., Jan. 1973.*

Continuous monitoring of automotive emission gas began in a commercial area of the Toshima District, Tokyo, in May 1971; monitoring of nitrogen oxides, wind direction and velocity was started in Sept. 1971. The NOx are taken by a teflon vinyl tube and passed into 20 ml of absorbent at the speed of 0.3 m/min. Absorbent is sultanyl acid solution and N (1-naphtyl) ethylenediamine hydrochloric acid. Nitric oxide is measured by passing the gas further through 5% potassium permanganese and 5% sulfuric acid mixture. The absorbent color is measured by photometric colorimetry, at 550 millimicron. The wind velocity and direction were measured by breeze anemometer for ten min. The NO measurements often exceeded 0.05 ppm in Nov., Dec. and Jan. Nitrogen dioxide showed no seasonal characteristics. High NO concentration frequency (hour average, 0.1 ppm) was approximately 20% in winter, and the frequency for NO2 was less than 10%. The daily fluctuation of NO showed double peaks in winter, between 7-9 am and 9-10 pm; NO2 showed no daily pattern. For Nov. through Feb., the wind directions were 50% north, or north by northwest.

35511 APTIC NO. 59494

AIR POLLUTION AND ITS SOURCES. *(Die Luftverunreinigung und ihre Quellen). Text in German. Bull. Eidgenoess. Gesundheitsamtes, Beilage B, no. 6:311-318, Dec. 1973.*

The sources of air pollution in Switzerland are surveyed. In Switzerland, regional and local air pollution is due to domestic heating and traffic, as well as to industry and trade. Domestic heating, for which fuel oil is mainly used, is responsible for sulfur dioxide and soot emissions. The SO2 levels measured in urban areas in winter are 5 to 10 times larger than those measured in summer. Unless adequate measures are taken, the domestic heating-generated air pollution will increase parallel to fuel consumption. Exhaust gases and gasoline vapors constitute the basic pollutants generated by automobiles. While evaporation losses have been minimized by positive crankcase ventilation, exhaust emissions, containing such pollutants as carbon monoxide, nitrogen oxides, unburned hydrocarbons, and lead compounds, continue to be a problem. Industrial firing equipment generates less soot but more SO2 than domestic heating equipment. Various gases, vapors, dusts, smoke, soot, and fluorides are the major specific industrial emissions. The respective shares of domestic heating, industries, and traffic in the generation of waste gases in Switzerland are 50%, 19%, and 23.5%.

1972

35512 APTIC NO. 59262

Barsdate, Robert J. and Richard C. Dugdale

EFFECTS OF VOLCANIC ASHFALLS ON CHEMICAL AND SEDIMENT CHARACTERISTICS OF TWO ALASKAN LAKES. *J. Fish. Res. Bd. Can., vol. 29:229-236, 1972. 16 refs.*

Cores from two lakes on Afognak Island, 150 km southeast of the Aleutian volcanic arc, indicated that several ashfalls have formed continuous layers over the lake basins, at least partially returning the lakes to a juvenile state with respect to their sediments. Abundant diatom remains were found in the sediments above each ash layer. During several hundred years after each ashfall, the transition to mature conditions followed a pattern characterized by decreasing diatom abundance and gradual increases in organic matter and clay-size inorganic particulates. High silica concentrations occurred in lakes within the area covered by the ashfall of the 1912 Mount Katmai eruption. (Author abstract)

35513 APTIC NO. 58664

Beall, Sam E., Jr. and Arthur J. Miller

URBAN UTILIZATION OF EXTRACTED HEAT AND WASTE HEAT FROM CENTRAL STATION POWER PLANTS. *American Chemical Society, Washington, D. C., Proc. Intersociety Energy Conversion Eng. Conf. 7th, San Diego, Calif., 1972, 7p. 9 refs. (Sept. 25-29, 1972.)*

Use of extracted and waste heat from central station steam-electric power plants reduces the consumption of fuels and thereby lessens the environmental impact of providing energy as compared to conventional systems. With large new cities or renewed old cities having areas of high population density, or with large concentrations of low-temperature steam consuming industries close to the plant, the dual-purpose plant system would be economically attractive. Establishment of such a system would require more planning and coordination of diverse organizations than are normally employed. However, considering the U. S. utilities are likely to have difficulty in finding 255 new power plant sites in the next 20 years, it would appear worthwhile to work toward the establishment of some dual-purpose plants and eliminate the heat rejection problems for those sites. From the standpoint of fuel consumption and air pollution, the use of extracted heat in existing cities would also be advantageous; but the retrofitting of existing cities is usually quite costly. Each city would have to be studied as a separate case. (Author conclusions)

35514 APTIC NO. 59005

Bede, Gabor, Gyula Csom, Vilmos Illei, and Gyorgy Szalkai

GROUP 2: NEW PROCESSES AND GENERAL TRENDS IN PROCESS IMPROVEMENT IN THE GENERATION, TRANSFER, TRANSFORMATION, AND CONSUMPTION OF ENERGY. *(2. szekcio. Uj eljarasok es az altalanos jellegu fejlodes az egyes folyamatok tokeletesitesere az energiatermeles, -atvitel, -atalakitas as -fogyasztas teruleten). Text in Hungarian. Energia Atomtech. (Budapest), 25(8-9):363-396, Aug.- Sept. 1972.*

New processes and general trends in the generation, transfer, transformation, and consumption of energy are surveyed on the basis of contributions by experts from different industrialized countries. Fly ash, dust, sulfur dioxide, nitrogen oxides, and waste heat are the major pollutants generated by thermal power plants. Dust and fly ash can be removed from the flue gases by means of electrostatic precipitators that reach efficiencies of 99% and over. Since there are no full-scale methods for the desulfurization of flue gases available, the SO2 emissions can be abated by proper choice of the fuels, and by fuel desulfurization. Nitrogen oxide emissions can be abated by maintaining nearly stoichiometric combustion conditions, two-stage combustion, and flue gas recirculation. Dry cooling towers, e.g., of the Heller Forgo system, also provide for improved conditions for flue gas dilution provided the stacks are located close enough to them. Energy generation-related air pollution and fluctuations in the energy consumption can be considerably abated by combinations of thermal power plants and heating power plants for remote heating e.g., by means of heat collectors. New sources of energy, and new processes of energy generation (magnetohydrodynamic systems, geothermal energy generation, solar batteries, and fuel cells) are being studied.

35515 **APTIC NO. 59048**

Diamant, W.

PARAMETERS INFLUENCING THE POLLUTANT EMISSIONS FROM COMBUSTION EQUIPMENT. *(Parametres agissant sur la limitation des polluants emis dans les appareils de combustion). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 11p. (May 3-5.)*

Parameters influencing the combustion conditions in general and the pollutants emissions in particular in a conventional domestic boiler were studied. The concentration of the pollutants emitted by the combustion equipment was principally determined by the viscosity of the fuel, the air excess coefficient, and fuel sulfur content. The fuel flow pattern occurring at the moment of fuel ejection in the combustion equipment is in close correlation with the concentration of the unburned pollutants. An optimum value of Reynolds number for which the lowest concentration of the unburned emission was found. Droplets which are too large and too small fail to burn completely, which results in increased emission of unburned residues. The mechanism of the formation of unburned hydrocarbons is largely determined by the degree of heterogeneity of the fuel jet. The mean diameters of the fuel droplets was a function only of the atomization pressure for a given surface tension.

35516 **APTIC NO. 58679**

Fraser, H. S. and E. P. Swan

CHEMICAL ANALYSES OF VENEER-DRYER CONDENSATES. *Canadian Forestry Service, Vancouver, B. C., Western Forest Products Lab., Rept. VP-X-101, 20p., July 1972. 7 refs.*

NTIS: PB-212 661

The compounds present in the smoke from a veneer dryer operating on Douglas-fir were condensed with great difficulty. The condensate was fractionated and characterized. Organic compounds are about one-third resin and fatty acids and about two-thirds neutrals. The acids identified were pimaric, sandaracopimaric, isopimaric, abietic, dehydroabietic, palmitic, stearic, oleic and linoleic. The neutral fraction was a complex mixture which was incompletely characterized, however, a 2% yield of beta-sitosterol was obtained. The total organic condensate was slightly toxic, its L. D. 50 being 1130 + or 183 mg/kg (intraperitoneal injection in mice). Plywood producers feel that lower drying temperatures and longer drying times will reduce smoke opacity. Emissions do not exceed permissible limits for particulates or hydrocarbons.

35517 **APTIC NO. 59462**

Grobman, Jack

REVIEW OF JET ENGINE EMISSIONS. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA-TM-X-68064, 17p., 1972. 15 refs. (Presented at the Department of Transportation Survey Conference: Climatic Impact Assessment Program, Cambridge, Mass., Feb. 15-16, 1972.)*

NTIS: N72-24830

A review is given of the emission characteristics of jet engines. The sources and concentrations of the various constituents in the engine exhaust and the influence of engine operating conditions and cycles on emissions are discussed. Cruise emissions from supersonic engines are compared with emissions from subsonic engines. The basic operating principles of the gas turbine combustor are reviewed with the effects of combustor operating conditions on emissions. The performance criteria that determine the design of gas turbine combustors are discussed. Combustor design techniques are considered that may be used to reduce emissions. Engine exhausts include the unreacted constituents in air, the products of complete combustion, the products of incomplete combustion (carbon monoxide and hydrocarbons), nitrogen oxides, and constituents due to trace elements in the fuel. Nitric oxide appears to be the only pollutant that is formed during high altitude cruise that has significant concentration. (Author abstract modified)

35518 **APTIC NO. 58670**

Gruss, K., E. Hluchan, and G. Balazova

THE FOLLOWING OF PHYSICAL AND CHEMICAL FACTORS OF THE ATMOSPHERE IN WINDOWLESS HALLS OF A POULTRY FARM. *(Sledovanie fyzikalnych a chemickych faktorov ovzdusia v bezokennych halach hydinarskeho velkozovodu). Text in Czech. Cesk. Hyg. (Prague), 17(9-10), p. 313-317, 1972. 6 refs.*

Air quality measurements were made in windowless halls of a poultry farm. The atmosphere in the halls was considerably polluted by ammonia with levels up to 90 mg NH3/cu m. The majority of the dust particles (93.6%) were smaller than 5 micron. The microclimatic conditions did not respond to the demands of hygienic standards even though the air was changed 6 times during 1 hr. The air conditioning equipment was not effective.

35519 **APTIC NO. 59203**

Henderson, R. D.

DIGGING INTO AIR POLLUTION PROBLEMS--AN EARTHMOVER S VIEWPOINT. *Society of Automotive Engineers, New York, Intern. Conf. Transp. Environ., Washington, D. C., 1972, p. 37-41. 3 refs. (May 31- June 2, Paper SAE P-44.)*

The emissions from off-highway industries which use predominantly diesel engine power are reviewed and emission regulations discussed. Earthmoving equipment and other off highway machinery are subject to smoke emission regulation in a limited number of states, and there is no Federal regulation for either smoke or gaseous emissions for this kind of machinery. Emissions of greatest concern are hydrocarbons, carbon monoxide, nitrogen oxides, and particulates. The estimated nationwide emissions from the Environmental Protection Agency s Summary of Nationwide Emission Estimates of Air Pollutants, 1969, shows that off highway, diesel-powered machinery is responsible for only about 0.06% of the HC, 0.08% of the CO, 1.36% of the NOx, 0.17% of the sulfur oxides, and 0.03% of the particulates. These small percentages represent little impact on total air pollution. Simple emission test procedures may suffice for the great variety of equipment used in the construction industry if standards are established. Non-productive testing to provide conformance to standards should be minimized. (Author abstract modified)

35520 **APTIC NO. 59056**

Hubbert, M. King

MAN S CONQUEST OF ENERGY: ITS ECOLOGICAL AND HUMAN CONSEQUENCES. *In: The Environmental and Ecological Forum 1970-1971. Dept. of the Interior, Geological Survey, Atomic Energy Commission UC-2, p. 1-50, 1972. 14 refs.*

NTIS: TID-25857

The use of energy during the last million years is reviewed. The terrestrial energy flux and use of coal, oil, and natural gas are discussed. The future use of fossil fuel is reviewed with respect to supply, demand, and environmental effects. Other sources of energy include solar energy, hydroelectric power, tidal and geothermal energy, and nuclear power. Production of metals, principles of ecology, and the effects of human affairs with a time prospective are also mentioned.

35521 **APTIC NO. 58347**

Karady, Pal

GROUP I: ENERGY NEEDS: RECENT DEVELOPMENT IN VARIOUS BRANCHES OF THE ECONOMY. *(I. szekcio. Energiaigenyek: ujabb fejlodes az egyes gazdasagi agazatokban). Text in Hungarian. Energia Atomtech. (Budapest), 25(8-9):350-362, Aug.-Sept. 1972.*

The state-of-the-art and the future development of the energy structure and of the energy needs in such countries as West Germany, France, Italy, Japan, the USA, Australia, and Finland are surveyed on the basis of papers presented at a conference on energy problems. While the energy demands in industry, households, agriculture, and transportation will continue to rise incessantly, the increase in electricity consumption will be the most conspicuous. Liquefied natural gas will be used extensively for both large-scale energy supply and for local peak shaving. The increase in the traffic density will call for new structures and solutions in transportation. The energy supply systems of urban agglomerations should be designed for future needs in a complex manner, duly considering all possible alternatives. The future energy demand will be largely influenced by the price of the fuels and by environmental concerns. The increasing use of natural gas and the abatement of the sulfur content in fuel oil have arisen from such environmental requirements.

35522 **APTIC NO. 59044**

Kastka, J., G. Winneke, and G. G. Fodor

MALODOROUS SUBSTANCES. *(Geruchsintensive Stoffe). Text in German. In: Medizinisches Institut fuer Lufthygiene und Silikoseforschung Jahresbericht 1971. Duesseldorf, Michael Triltsch Verlag, 1972, p. 103-110. 12 refs.*

Surveys conducted among populations living near industrial plants emitting malodorous pollutants concerning odor nuisances are reviewed. A survey conducted in the USA revealed that some 10% of the U. S. population lives in areas plagued by odors. Another survey of complaints of any kind in Japan shows that some 1/5 of a total of over 40,000 complaints are related to odor nuisances. In general, 5 to 15% of the population are affected by malodorous emissions, and about 20% of all environmental complaints are concerned with odor nuisances in highly industrialized countries. Thirty six percent of a population living within 20 km radius around a sulfate pulp plant complained about odor nuisances. The same inquiry revealed close correlation with the frequency of odor-related nuisances and the distance from the sulfate pulp plant. The subjective complaints about odor nuisances are not necessarily correlated with more objective nuisances, e.g., headache, and irritation of the respiratory tract.

35523 **APTIC NO. 59030**

McCalla, T. M.

POLLUTION AND WASTE MANAGEMENT. *Soil Conservation Society of America, Earth Around Us, Proc. Soil Conserv., Soc. Am., Annu. Meet., 27th, Portland, Oreg., 1972, p. 61-71. 4 refs. (Aug. 6-9.)*

Urban waste is discussed including trash and garbage, sewage, air pollutants, and mining waste. Waste from agriculture and forestry includes chemical air pollutants, dust, sediments, plant nutrients, organic wastes, and infectious agents and allergens. The types of wastes, waste disposal, and pollution from wastes are reviewed.

35524 **APTIC NO. 58688**

Nishida, Konosuke

AUTOMOBILE EXHAUST POLLUTION, PRESENT AND FUTURE. *(Jidosha haiki mondai no kongo). Text in Japanese. Osaka Keizai (Osaka Econ.), no. 61:72-95, 1972. 32 refs.*

The amount of pollutants emitted on the road by automobiles is much greater when the driving speed is slow. In actual measurements, the amount of carbon monoxide emitted by a car driving at 83.1 km/hr on an express highway was 2.3 g/km and hydrocarbons were 1.8 g/km. But emissions emitted by a car moving at the speed of 19.9 km/hr were 369 g/km CO and 567.7 g/km HC. The express highways in Tokyo have many bends and hills, and they go through tunnels at many points. Emitted exhaust gas has no outlet, and the odor and aldehyded concentrations become damagingly heavy. The poor design of the connecting points between high speed roads and the tunnel outlets has caused jamming of traffic in many areas and slow driving on express roads. Engine design modification, exhaust reactors, exhaust gas recirculation systems, catalytic converters, non-lead gasoline, and control of fuel evaporation are reviewed. And as new forms of transportation, electric cars, gas turbine cars, and steam automobiles, are reviewed. In the order of feasibility of adaptation as new dynamic systems, gas turbines, thermal engines by a batterys, steam engines, thermal engine fly wheels, and alkali-metal batterys are listed in that order.

35525 **APTIC NO. 59027**

Odell, F. Glen

AGRICULTURE AND AIR POLLUTION. *Soil Conservation Society of America, Earth Around Us, Proc. Soil Conserv. Soc. Am., Annu. Meet., 27th, Portland, Oreg., 1972, p. 131-134. 9 refs. (Aug. 6-9.)*

Agricultural damage can be caused by air pollution, agriculture can also be the source of pollution (pesticides, pollens, odors, fugitive dust, and combustion products from crop burning and orchard heating), and agriculture can also be anti-pollution agent by absorbing carbon dioxide and other pollutants. These aspects of agriculture are reviewed in general items.

35526 **APTIC NO. 59449**

Ohman, Howard L., John Viletto, Jr., Kenneth T. Anderson, and L. LeForest Miller

POTENTIAL SAND AND DUST SOURCE AREAS. (REPORT NO. 1 OF STUDIES OF THE ARMY AVIATION V/STOL ENVIRONMENT). *Army Engineer Topographic Labs., Fort Belvoir, Va., Geographic Sciences Lab. and Agriculture Dept., Soil Conservation Service, Reimbursable Service RO 72-10, Rept. ETL-SR-72-1, 14p., Aug. 1972. 10 refs.*

NTIS, DDC: AD 749462

World patterns of various soil types that have a potential for generating atmospheric sand and dust through natural causes or man-induced mechanical agitation are discussed. Three maps are used to show soil types as determined by classes of particle size, seasonal durations of wet, moist, and dry soil conditions, and the distribution of siliceous, vitreous, saline, and acidic soils, soils with high percentages of iron and aluminum, and soils consisting largely of montmorillonitic clays. The maps provide the basis for a realistic assessment of Army aircraft design problems which can be attributed to sand and dust. Additionally, they contribute to the total store of environmental information needed to determined the environmental criteria to be adopted in the design and testing of Army V/STOL aircraft. Soil texture, size, particle shape, moisture, and chemical and physical properties are reviewed. (Author summary modified)

35527 **APTIC NO. 59504**

Ranzieri, Andrew J.

AIR QUALITY MANUAL. ANALYSIS OF AMBIENT AIR QUALITY FOR HIGHWAY PROJECTS. *California Division of Highways, Materials and Research Dept., Rept. CA-HWY-MR657082S-5-72-13, 11p., July 1972. 22 refs.*

A California Division of Highways air quality manual on analysis of ambient air quality for highway projects has been prepared as part of a program designed to train district personnel in assembling air quality reports. Topics covered include: air pollution control districts in California; problems in using existing fixed location air quality data for a distant highway location; ambient air quality data to be obtained from existing stations; sampling procedures for on-site ambient air quality surveys; statistical analysis of ambient air data; mesoscale analysis of ambient air quality data (transported air pollution, time history of number of adverse days, pollutant burden concept); and prediction of future pollutant concentrations. Appendices covering air quality data for California and statistical analysis of ambient air quality are also provided.

35528 **APTIC NO. 59506**

Shirley, Earl C.

AIR QUALITY MANUAL. TRAFFIC INFORMATION REQUIREMENTS FOR ESTIMATES OF HIGHWAY IMPACT ON AIR QUALITY. *California Division of Highways, Materials and Research Dept., Rept. CA-HWY-MR657082S(3)- 72-09, 34p., April 1972. 11 refs.*

A California Division of Highways air quality manual on traffic information requirements for estimates of highway impact on air quality has been prepared as part of a program designed to train district personnel to assemble air quality reports. Topics covered include: vehicle operating mode and pollutant emissions (hydrocarbons, carbon monoxide, and nitric oxide); vehicle volumes; traffic network changes; traffic growth factors; time framework for estimates; traffic parameters and environmental effects (mesoscale and microscale); and minimum traffic estimate requirements.

35529 **APTIC NO. 59497**

Westfield, William T.

ESTIMATION OF ENGINE EMISSIONS AT ALTITUDE THROUGH GROUND TESTING. *Society of Automotive Engineers, Washington, D. C., Soc. Automotive Engrs. Int. Conf. Transp. Environ., Proc., Washington, D. C., 1972, p. 86-93. 1 ref. (May 31-June 2, Paper 720612.)*

An afterburning turbofan engine was operated over a range of simulated altitudes and Mach numbers to determine if a correlation existed between static sea level emissions of carbon monoxide, total unburned hydrocarbons, oxides of nitrogen, and particulate matter and those at altitudes and flight speeds. Data were taken at a point about 27 ft downstream of the exhaust nozzle exist and on the centerline of flow. No apparent effect of altitude or flight speed on emissions, either gaseous or particulate, was observed. Total HC resulting from operation in the low power range of any one afterburning zone were higher than the total HC emissions resulting from operation in the higher power region of the same afterburning zone; NOx did not readily reveal any separate trends associated with the individual zones of afterburning. Nonafterburning modes gave a larger number of particles per grid; and, as the level of afterburning was increased, the number of particles decreased. Carbon monoxide emission levels decreased as the level of power within each zone was increased. (Author abstract modified)

35530 **APTIC NO. 58734**

Winger, John G., Gerald D. Gunning, John D. Emerson, Richard C. Sparling, and Arthur J. Zraly

OUTLOOK FOR ENERGY IN THE UNITED STATES TO 1985. *Chase Manhattan Bank, New York, Energy Economics Div., 56p., June 1972.*

The sources, consumption, markets, demand, and uses of energy are described. Increased population and increased use of energy per capita will increase the demand for energy in the future. The transportation market was 24% of the total energy market in 1970 and will be 21% of the total market in 1985. Increased transportation use has increased pollution, mostly from automobiles. Trucks, buses, aircraft, agricultural and off-road vehicles, ships and boats, and railroads also consume energy and produce pollution. The industrial market was 32% of the total energy market in 1970. Coal, natural gas, and oil were 22%, 49% and 29% of the sources of energy in 1970. Only 5% of the total energy market goes to the commercial market. Primary sources of energy were coal (less than 1%), oil (40%), and natural gas (60%). The residential market consists of 14% of the total energy market. Coal (3%), gas (52%), and oil (45%) are the primary sources of energy. The electric utilities market was 25% of the total market in 1970 and will be 37% in 1985. The primary energy requirements of the five major markets in 1970 are 32,980 thousand bbls daily, and in 1985 will be 63,715. Energy use for the east coast, north central, Gulf coast, Rocky Mountain, and west coast regions is divided by primary sources (oil, nuclear, natural gas, coal, and water). The supplies of oil, natural gas, petroleum, coal, nuclear energy, and water power are decreasing, and shortages are certain to become greater. The flow of energy in the U. S. from 1970 to 1985 is reviewed.

35531 **APTIC NO. 58312**

Tokyo Metropolitan Government (Japan), Toshima District

PUBLIC NUISANCE IN THE TOSHIMA DISTRICT. *(Toshima no kogai). Text in Japanese, 181p., Dec. 1972.*

A comprehensive administrative report on pollution investigation, complaints, and solutions in the Toshima district of Tokyo is presented. Air pollution in this district has progressed rapidly since about 1955, and sulfur oxides, sulfur hydroxide, nitrogen oxides, and suspended particulates pollute a large area. The main emission sources are factories, combustion gases from public baths, building heating systems, and automobile emission gases. Carbon monoxide, lead concentration, and automobile traffic amount have been continuously monitored since 1970. The CO is sampled by 12 automatic air samplers and analyzed by nondispersive infrared analyzer. Lead is sampled by suction and filter paper, and an atomic absorption spectrophotometer. The traffic is counted by manual counter for 10 min every hour in categories of gasoline cars, LPG cars, and large vehicles, and the figures are multiplied by six for hourly counts. The NOx is measured by Saltzman s colorimetry. Of the total of 969 complaints registered at the district office between 1969 and 1971, 123 were against smoke, 60 for dusts, 7 for harmful gases, 155 for bad odors, 4 for water pollution, 513 for noise, and 73 for vibrations.

35532 **APTIC NO. 59255**

New South Wales, Australia, Air Pollution Advisory Committee

TENTH ANNUAL REPORT OF THE AIR POLLUTION ADVISORY COMMITTEE. *Rept. 68, 23p., Oct. 1972.*

Recent amendments to the Clean Air Act and licensing and regulatory activities of the Air Pollution Advisory Committee are reported. Developments in air pollution control programs in the ceramics, chemical, coke, primary metallurgical, gas, grinding and milling, oil refining, scrap metal recovery, cement, premix bitumen, and ferrous and non-ferrous metal industries, as well as boilers, incinerators, furnaces, railways, and petroleum storage depots are reviewed. The problem of motor vehicle emission control is discussed. Results of air pollution monitoring for smoke, dust, sulfur dioxide, carbon monoxide, and total oxidants, and stack surveillance of particulate matter and chemical composition of stack emissions are presented. Vegetation damage from air pollution, the imput to a telephone complaint service, and the development of a new instrument for measuring ozone are reported.

1971

35533 **APTIC NO. 58886**

Burnett, Ronald D.

AIR POLLUTION AND INDUSTRIAL HYGIENE EVALUATION OF MAINTENANCE SHOPS, TINKER AFB, OKLAHOMA. *McClellan AFB, Calif., Environmental Health Lab., Proj. OAF-113, 71M-21, 64p., Oct. 1871. 6 refs.*

NTIS: AD 752534

An evaluation of ambient air and industrial hygiene for Building 3001, 214, 230, and 2122 is presented. The silver soldering processes in 3001 resulted in cadmium oxide fume concentrations in the worker's breathing zone of 7 to 20 times the accepted exposure level. Thus, a serious potential health hazard existed in this area; however, the hazard had been recognized and local exhaust ventilation was in the process of being installed. Disposable paper respirators similar to surgical masks were being used in several dusty areas and, although no hazardous exposures were involved, it is recommended that only Bureau of Mines approved respirators be used. In general, excessive exposures to trichloroethylene vapors resulted primarily from poor operator technique. An extensive operator educational program should be initiated to instruct operators as to the proper techniques required to minimize trichloroethylene loss. In several processes inadequate ventilation was found and, although excessive or toxic exposures of individuals were not involved, increased or more adequately designed ventilation was recommended. These include engine cleaning and disassembly, heliarc welding and acid core soldering, Zyglo powder developing, and metal cleaning.

35534 **APTIC NO. 58605**

Cairns, R. Bryan

ANALYSIS OF GROUND OPERATIONS AT AIRPORTS TECHNICAL PROPOSAL. *Boeing Scientific Research Labs., Seattle, Wash., Environmental Sciences Lab., Federal Aviation Administration Request for Proposal WA5R-1-0246, D1-82-1042, Boeing Letter 2-1107-3400-023, 52p., Jan. 1971. 13 refs.*

NTIS, DDC: AD 733111

A 12-month technical effort is proposed to analyze ground operations at airports. Tasks will include investigation and model development, model validation, and model extension. Background and objectives of the study of airport ground operations and concomitant pollution are described. The methods of achieving these objectives include procedural studies for minimizing pollutant emissions, the compilation of an inventory of pollutant sources, the development and use of an existing mathematical model to describe atmospheric dispersion mechanisms, and model iteration and verification with data in a field measurement program. Carbon monoxide, hydrocarbons, particulates, and nitrogen oxides would be measured. Major problem areas and additional information on the mathematical model are discussed. Scheduling, professional capability, and background experience are also mentioned.

35535 **APTIC NO. 59446**

Ducsik, Dennis W., Paul Mertens, and George Neill

OFFSHORE SITING OF ELECTRIC POWER PLANTS. *In: Power, Pollution, and Public Policy - Issues in Electric Power Production, Shoreline Recreation, and Air and Water Pollution Facing New England and the Nation. Massachusetts Inst. of Technology, Cambridge, Mass., Sea Grant Project Office, NOAA Contract GH-88, Mit Rept. 24 Rept. NOAA-72022912-2, p. 29-87, June 1971. 79 refs.*

NTIS: COM-72-10398

The siting of electric power stations for the New England coastal area at offshore locations was investigated in terms of the technical, economic, and legal feasibility of the concept and its potential for the effective resolution of land use conflicts while having extremely attractive features in the areas of environmental protection and public safety. The concept has a high degree of economic feasibility. Electric power costs to industry in the New England Coastal Area might be reduced to a level competitive with the national average; concurrently, inland and shoreline air and water pollution problems associated with power production might be eliminated. The concept is technically feasible with only minor extensions of current engineering capabilities and is adaptable to nuclear, fossil fuel, and magnetohydrodynamic generating plants.

35536 **APTIC NO. 58609**

Hoek, G. A. L. van

REVIEW OF ELECTRIC POWER SUPPLY IN THE NETHERLANDS. *Inst. Mechanical Engineers, London (England), Steam Plant Group and Koninklijk Inst. van Ingenieurs (Netherlands), Mod. Steam Plant Pract., Proc., Gravenhage, Netherlands, 1971. p. 50-61, 125-145. (April 28-30, Paper C73/71.)*

The electricity supply is reviewed from the standpoint of electricity generation and the interconnection of power stations in the Netherlands. Typical data of the electricity supply industry are given, and the emphasis is on the fact that generation in the Netherlands is entirely on a thermal basis. Special requirements originating from this condition are mentioned, and a coordinated and obligatory extension program for generating plants is described. Production units form an integrating part of the electricity supply structure, and thus must fulfill a task which, to a large extent, is defined by the variation of consumers demand. Periodic site testing to verify that the generating plant matches the system characteristics is strongly recommended. The history and future of electricity generation in the Netherlands are described. (Author abstract modified)

35537 **APTIC NO. 58686**

Johnson, Henry and Michael C. Fluharty

THE DETERMINATION OF LEAD, CADMIUM, ZINC AND MERCURY IN SOLID WASTE AND EFFLUENTS OF SOLID WASTE MANAGEMENT SYSTEMS. *Preprint, Office of Research and Monitoring, Solid Waste Research Div., Open-file Rept. RS-04-68-06, 24p., 1971. 6 refs.*

The determination of lead, cadmium, zinc, and mercury by atomic absorption spectroscopy in solid waste and effluents of solid waste management systems is discussed. The metals were present to some extent in all the refuse samples analyzed. Their presence in the emission samples was, in some cases, greater than the recommended levels. Since these concentrations are actually from source samples, it is difficult to determine whether or not the levels are of toxicologic or even asthetic significance. It appears that incineration produces approximately 1/40th as much Pb pollution as the total number of automobiles in the city. The 11 refuse samples analyzed contained an average of 2.4 ppm of Hg, whereas rocks and soils, some shales, and coal, show average concentrations of 0.1 ppm, 10 ppm, and 1 ppm respectively. Three compost samples contained an average of 1.1 ppm. The levels of Pb, Cd, and Hg in compost were near those for refuse. Zinc showed much higher concentrations in compost than in refuse. The landfill leachate samples showed no Pb or Cd and only traces of Zn and Hg.

35538 **APTIC NO. 58761**

Lunin, Jesse

AGRICULTURAL WASTES AND ENVIRONMENTAL POLLUTION. *In: Advances in Environmental Science and Technology. James N. Pitts, Jr. and Robert L. Metcalf (eds.), Vol. 2, New York, Wiley, 1971, p. 215-261. 91 refs.*

The sources of agricultural wastes and environmental pollution are discussed. Of the 30 million tons of natural dusts entering the atmosphere annually, a large portion comes from wind-blown soil. Other agricultural industries, such as cotton ginning, alfalfa milling, feed lots, and harvesting contribute a significant amount to the problem of airborne particulates. Dust from agricultural lands also may be a source for the transmission of pesticide residues. Smoke from forest fires and burning of crop residues releases large amounts of particulate and chemical pollutants into the atmosphere each year. Airborne allergens, such as pollen from weeds, represent a problem of considerable magnitude. Other sources of pollution which primary water and soil include: sediment, salts and minerals, animal wastes, fertilizers containing phosphorus and nitrogen, pesticides, and processing wastes. Factors affecting pollution from an agricultural watershed and evaluation of the pollution are discussed.

35539 **APTIC NO. 58740**

Maga, John A.

MOTOR VEHICLE EMISSIONS IN AIR POLLUTION AND THEIR CONTROL. *In: Advances in Environmental Science and Technology. James N. Pitts, Jr. and Robert L. Metcalf (eds.), Vol. 2, New York, Wiley, 1971, p. 57-89. 19 refs.*

Motor vehicle emissions in air pollution and their control are summarized. The sources of motor vehicle emissions include exhaust, crankcase, fuel tank, and carburetor. The exhaust contributes the greatest quantity as well as the largest number of contaminants to the air. Carbon monoxide, hydrocarbons, and oxides of nitrogen are the most important pollutants. Crankcase emissions are mostly hydrocarbons and are caused by the escape of gases from the cylinder during the compression and power strokes. Evaporative losses from fuel tanks are mainly hydrocarbons and additives. Emissions from carburetors occur mostly during the period after the engine is turned off and when the carburetor bowl is subejected to heating from the hot engine. The emissions reach 10 g hydrocarbons. Emissions from diesel engines cause to well recognized air pollution problems, smoke and odors, which normally are not associated with automobiles. Other topics discussed include: legal basis for control of motor vehicle emissions, emissions standards for gasoline and diesel powered vehicles, control implications of emission standards, and future motor vehicle emission standards. Control systems for motor vehicle emissions are discussed and three alternate power plants are suggested: gas turbine engine, battery power, and steam engine.

35540 **APTIC NO. 59038**

Rosenson, Ronald

TECHNOLOGY AND RESEARCH IN THE RECYCLING OF PRECIOUS METAL SCRAP. *National Assoc. of Secondary Material Industries, Inc., New York, and Bureau of Mines, Washington, D. C., Eff. Technol. Res. Scrap Met. Recycling, Proc. Workshop, Washington, D. C., 1971, p. 55-58. (Jan. 7.)*

Initially, the precious metal refiner is contacted by industry or a scrap metal processor to institute a precious metal reclamation program that would yield maximum returns for the available material in a minimum amount of refining time. The program must conform to current ecological regulations, such as smoke control, clean work areas, minimum solvent contamination, and controlled discard of waste solutions. What materials should be processed separately, and what materials can be combined to yield maximum returns for the supplier must be advised. Examples are taken from the processing of printed circuit boards, gold-plated nickel alloys, x-ray film, electronic scrap, telephone relay scrap, and various types of silver alloys employed in industrial applications as well as coins. Chemical stripping of metals results in the problem of disposing the spent solutions. Recovery of silver by burning x-ray film results in air pollution.

35541 **APTIC NO. 58618**

Sribner, N. G., B. I. Arlyuk, and L. G. Barbakadze

ENTRAINMENT OF DUST PRODUCTS FROM ROTARY FURNACES WITH SPRAY SLURRY FEED. *Sov. Chem. Ind. (English translation from Russian of: Fiz. Khim.) no. 11:768-772, Nov. 1971. 8 refs.*

Counterflow rotary furnaces with spray feed of slurry are used in a number of industries for drying and heat treating materials. An increase in the output of such furnaces is sometimes restricted by entrainment of the material undergoing heat treatment. The amount of product entrained by the flow of exhaust gases sometimes reaches 50% of the overall furnace output. Therefore the analysis of entrainment is significant for the well-founded design of powerful new furnaces, as well as for intensification and optimization of the performance of existing assemblies. The entrainment of the dusts from rotary furnaces with spray slurry feed is analyzed mathematically.

35542 **APTIC NO. 58861**

Vaughan, William P. and Stephen R. Fuller

MERCURY VAPOR EMISSIONS: REPORT ON AERIAL SURVEY OF SOURCES POTENTIALLY AFFECTING THE AIR IN ILLINOIS. FINAL REPORT. *Committee for Environmental Information, St. Louis, Mo., Illinois Institute for Environmental Quality Contract 10.008, Rept. IIEQ 71-3, 21p., June 1971. 13 refs.*

NTIS: PB-204520

The feasibility of rapid aerial detection of mercury emitters was demonstrated. The basic principle of the instrument used is detection of the absorption of light at 2536.5 A by atoms of Hg vapor. The instrument is described in detail. The technique is capable of pinpointing and evaluating hitherto unexpected sources for Hg vapor emissions. A few atmospheric sources may contribute many tons of Hg to the environment. Estimated outputs range between 100 lbs/yr and 5400 lbs/yr of Hg vapor for the twelve sites where sufficient information was available. Eight power plants account for 8700 lbs/yr emitted into the atmosphere. Four incinerators emit an estimated 12770 lbs/yr into the atmosphere. Fluctuation in calculated outputs among power plants can in part be attributed to differing levels of Hg in the coal consumed, independent of sample variability.

35543 **APTIC NO. 58690**

National Industrial Pollution Control Council

PLASTICS IN SOLID WASTE. *Washington, D. C., 20p., March 1971. 17 refs.*

Plastics constitute a small but growing share of total solid waste. Plastics now comprise an estimated 3% by weight of collected household, commercial and industrial refuse. About two-thirds of this share is plastic packaging. Because of their inertness, plastics make a suitable component for landfill. Plastics can be incinerated with few complications even in present substandard equipment of the properly operated; however, particulate and gaseous emissions are often a problem. In future incinerator-power plants, plastics may serve as a valuable fuel source. Research is underway to perfect separation systems as the first step for eventual reclamation of plastics from non-homogeneous solid wastes. Ammonia, oxygen, hydrogen chloride, and a variety of grease and wax-like materials have been experimentally produced by pyrolysis. Scrap plastics may be used as an aggregate supplement for concrete.

35544 **APTIC NO. 58694**

Office of Air Programs, Rockville, Md., Federal Sources Branch

REAL PROPERTY OWNED BY THE FEDERAL GOVERNMENT IN THE STATE OF NORTH DAKOTA. *Office of Air Programs, Rockville, Md., 17p., June 1971.*

NTIS: PB 209998

A summary compilation of the major facilities of real property owned by the Federal government in North Dakota is presented. The installations ranging in size from 0-1500 sq ft have been omitted from the inventory. Experience indicates that this category size generally includes facilities such as navigational aids, undeveloped building sites, or telephone lines, and currently does not present any air pollution potential.

1970

35545 **APTIC NO. 58953**

Hate, J. N.

AN ELECTRIC CAR FOR INDIA. *Indian Eastern Engr. (Bombay), no. 114:129-135, 1970 (?). 16 refs.*

The design of a suitable small electric car for India is considered in terms of its economics of working and feasibility of manufacture. A simple layout for the electric car is depicted; and general specifications, power requirements, and curves for torque, horsepower, and tractive resistance are provided. Design considerations indicate that the proposed vehicle is capable of satisfying the several criteria required for the drive gear ratio and smooth performance, i.e., an acceleration of 0.9 m/sec at 16 km/hr, gradient of 1 in 7 at 10 km/hr, and a free running speed of 55 km/hr. Comparative estimates are provided for the capital and running costs of the electrical car versus a corresponding gasoline car. It appears feasible to build a reliable electric car for India at a reasonable cost and with a minimum of resulting pollutants.

35546 **APTIC NO. 58660**

Nishida, Konosuke

THE ESTIMATION OF EXHAUST EMISSIONS AND THE DISTRIBUTION OF AUTOMOBILES IN OSAKA CITY BASED ON THE ANALYSIS OF AIR-PHOTO. *(Koku shashin ni yoru jidosha kotsu-to no chosa). Text in Japanese. Kyoto Univ. (Japan), Dept. of Sanitary Engineering, p. 149-159, 1970. 16 refs.*

Aerial photographs of the city of Osaka and vicinity were taken at the altitude of 1500 m for the purpose of investigating the amount of traffic to be used for calculation of air pollution. The entire course was divided into 12 runs, and approximately 20-22 photographs were taken for each run. The photos were enlarged to 1/2000 and automobiles on the roads were counted. Saturdays, Sundays, and days with especially heavy traffic were excluded. At the heaviest traffic point during the day, outside Osaka, 123,142 were counted between 7 am and 7 pm. In the city proper, the area of the Osaka railroad station is heavy and over 90,000 automobiles were noted during the day. The night traffic was about 42,721 at the heaviest point. Compared to the previous year, there was an increase of 195% in the traffic of the city of Osaka, and an increase of 36% during the day in the greater Osaka, and a decrease of 41% at night. Automotive emissions calculated from 73,152 automobiles on the main roads of the city of Osaka were estimated to be 113.94 tons/hr of carbon monoxide and 14,764 tons/hr of hydrocarbons. In reality, there are considerable variations by time of day and day of week; peaks generally formed at 10 am and 5 pm.

35547 **APTIC NO. 59047**

Sternoff, David R.

INCINERATORS FOR THE SECONDARY METALS INDUSTRY. *National Assoc. of Secondary Material Industries, Inc., New York, Air Pollut. Control Technol., Proc. Workshop, Chicago, Ill., 1970, p. 104-106, 111-116. (Oct. 22.)*

An incinerator can be either a multiple chamber incinerator or a series of afterburning chambers employing a pressure drop system. In this system particles that cannot be burned are filtered out onto the floor of the lowest pressure chamber. An incinerator utilized for secondary materials processing, should be specially designed to handle each specific material. Large incinerator corporations do not usually supply incinerators to the scrap metal industry or to any other secondary material industry. Incinerators should be designed so that the proper number of BTUs needed to bring the temperature in the afterburning chambers to approximately 1600 degrees are available at all times. The incinerator must be of the proper number of adequate size and the proper amount of cu ft of air moving through the afterburning chambers must be maintained. If much polyvinyl chloride is processed, then either a scrubber, baghouse, or precipitator should be added. Installation and fuel costs of incinerators are estimated.

35548 **APTIC NO. 58887**

Public Health Service, Washington, D. C., National Air Pollution Control Administration

NATIONAL EMISSION STANDARDS STUDY. REPORT. APPENDIX-VOLUME 3. APPENDIX F (PART 2). A REPORT TO THE CONGRESS OF THE UNITED STATES BY THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE IN COMPLIANCE WITH PUBLIC LAW 90-148 CLEAN AIR ACT, AS AMENDED. *263p., March 1970. 56 refs.*

An appendix concerned with major stationary sources of air pollution and their characteristics is provided for a national emission standards study by the National Air Pollution Control Administration for the Congress of the United States. Sources covered include: nonferrous metallurgical operations, petroleum refining, phosphate fertilizers, phosphoric acid production, pulp mills, rendering, soap and detergent manufacturing, the iron and steel industries, sulfuric acid production, incineration, and steam-electric power plants (coal/oil fired).

1969

35549 **APTIC NO. 59261**

McCarthy, J. H., Jr., W. W. Vaughn, R. E. Learned, and J. L. Meuschke

MERCURY IN SOIL GAS AND AIR-A POTENTIAL TOOL IN MINERAL EXPLORATION. *Geol. Surv. Circ., no. 609: 1-17, 1969. 7 refs.*

GPO

The mercury content in soil gas and in the atmosphere was measured in several mining districts to test the possibility that the Hg content in the atmosphere is higher over ore deposits than over barren ground. At Cortez, Nev., the distribution of anomolous amounts of Hg in the air collected at ground level (soil gas) correlates well with the distribution of gold-bearing rocks that are covered by as much as 100 ft of gravel. The Hg content in the atmosphere collected at an altitude of 200 ft by an aircraft was 20 times background over a Hg deposit and 10 times background over two porphyry copper deposits. Measurement of Hg in soil gas and air may prove to be a valuable exploration tool. (Author abstract)

1968

35550 **APTIC NO. 58760**

Gedgaudas, Marius J.

AN EMISSION INVENTORY FOR JEFFERSON COUNTY (BIRMINGHAM), ALABAMA. *Dept. of Health, Education, and Welfare, National Air Pollution Control*

Administration Abatement Program, APTD-0893, 61p., Dec. 1968. 15 refs.

An emission inventory for Jefferson County (Birmingham), Ala., is presented. The information includes: a map of Jefferson County showing the selected grid zones; a map locating the point sources with an accompanying table listing the emissions at each source; the emission data by grid in the required format; the average day emission density maps for each pollutant; and the intermediate calculations for each grid. The estimated emissions for 1965 for various pollutants in tons/yr are particulates, 204,715; carbon monoxide, 252,725; hydrocarbon organic acids, 63,961; sulfur oxides, 33,538; nitrogen oxides, 25,533; aldehydes, 650; and ammonia, 202. The greatest source of particulate emissions is from stationary sources, and in particular from industrial sources. Hydrocarbon pollutants come from both stationary and transportation sources. Carbon monoxide is primarily from transportation sources. (Author summary modified)

1967

35551 **APTIC NO. 58606**

Bethge, Per Olof and Lalla Ehrenborg

IDENTIFICATION OF VOLATILE COMPOUNDS IN KRAFT MILL EMISSIONS. *Svensk Papperstid. (Stockholm), 70(10):347-350, Nov. 1967. 3 refs.*

DDC: AD 661620

Blow gases and raw turpentine from a kraft mill were analyzed to identify the volatile compounds which cause odors. Gas chromatography and mass spectrometry were the analytical methods used. Relative retention times for the compounds found are listed. A number of terpenes, alcohols, sulfides, and other compounds were found.

1966

35552 **APTIC NO. 58658**

Anastassakis, C. E.

A STUDY OF THE COMPOSITON OF DIESEL EXHAUST GASES. *(Original language title) (Meleti tis systasseos Ton kafsaerion Ton Mihanon Diesel). Text in Greek. Chim. Chron., 31(7):81-87, 1966.*

Volumes and compositions of air pollutants emitted by a single- cylinder diesel engine under a wide range of loads and air-to-fuel ratios were studied. The minimum concentrations of carbon monoxide, aldehydes, and hydrocarbons were obtained at intermediate values of the fuel-to-air ratio, amounting in this experiment to 0.03:1.0. Concentrations of these pollutants increased for both higher and lower loads, i.e., higher or lower fuel-to-air ratios. The maximum concentrations of nitrogen oxides were observed at intermediate values of the fuel-to-air ratio, i.e., when the machine was operating at medium loads.

1963

35553 **APTIC NO. 59211**

Edson, Murray H. and C. Fayette Taylor

THE LIMITS OF ENGINE PERFORMANCE -- COMPARISON OF ACTUAL AND THEORETICAL CYCLES. *Society of Automotive Engineers, Inc., New York, Digital Calc. Engine Cycles, Proc., 1963 (?), p. 65-8. 34 refs.*

To evaluate the performance of spark ignition internal combustion engines, the theoretical limits of reciprocating engine performance set by the idealized constant-volume cycle was analyzed. Fuel-air cycles have been computed in the past by tracing them on thermodynamic charts. To eliminate this long and tedious process, the thermodynamic characteristics of the fuel-air media and the cycle processes were programmed on a digital computer. The characteristics of fuel-air cycles over a wide range of fuel-air ratios, compression ratios, and initial conditions were computed and presented in graphic form. The results were used to compute equivalent theoretical cycles for comparison with real engine performance. The ratio of actual to ideal thermodynamic performance of engines was computed using equivalent cycles. The method to evaluate engine performance is illustrated, a number of actual cycles are compared with their equivalent air-fuel cycles, and losses are considered. The actual engine efficiency was compared to the mean effective pressure. Variations in initial pressure up to 6 atm, residual gas fraction 0.0-0.1, and atmospheric moisture fraction 0.0-0.06 had very small effects on efficiency, although their effects on mean effective pressure may be large. (Author abstract modified)

35554 **APTIC NO. 59232**

Edson, Murray H.

THE INFLUENCE OF COMPRESSION RATIO AND DISSOCIATION ON IDEAL OTTO CYCLE ENGINE THERMAL EFFICIENCY. *Society of Automotive Engineers, Inc., New York, Digital Calc. Engine Cycl., Proc., 1963 (?), p. 49-64. 34 refs.*

The ideal Otto cycle engine is theoretically analyzed to examine the influence of the compression ratio and dissociation on engine thermal efficiency over an extreme range of compression ratios (4-300) to see if chemical dissociation could limit Otto cycle engine thermal efficiency. Assuming isooctane, benzene, ethyl alcohol, and nitromethane to be the fuels being consumed, the effects of compression ratio and mixture strength on the thermodynamic properties and equilibrium species concentration of the working fluid at every step in the ideal Otto cycle were computed. The calculations were made using a mathematical model of the ideal adiabatic engine programmed to an IBM 704 digital computer. The effect of compression on engine thermal efficiency was calculated over a wide range of operating conditions. The engine thermal efficiency continued to increase with compression ratio at least up to 300:1 for all fuels considered. The effect of compression ratio and mixture strength on chemical dissociation was studied using the parameters extent of dissociation and net energy loss. The first was the deviation from the theoretical concentration of product species when a given fuel/air mixture is burned. The net energy loss associated with chemical dissociation was defined as the change in internal energy between a burned mixture at chemical equilibrium and the frozen theoretical burned mixture when both are at some selected temperature and pressure level. Both dissociation parameters were examined after combustion at top dead center in the Otto cycle engine at various levels of compression ratio and mixture strength. The extent of dissociaton and net energy loss increased with increasing compression ratio. The increase was small. Under theoretical and ideal conditions, there was no upper limit to which the compression ratio of the Otto cycle engine can be raised. Any increase in chemical dissociation brought about by increasing temperature is substantially suppressed by the very rapidly increasing pressure levels which result when the compression ratio is increased. (Author abstract modified)

35555 **APTIC NO. 58725**

Fisher, J. F. C.

SOME APPLICATIONS OF PHYSICAL CHEMISTRY TO THE SULPHATE ROASTING OF METALLIC SULPHIDES. *Trans. Inst. Mining Met., vol. 73:109-117, 1963-1964. 13 refs. (Presented at the IMM, General Meeting, Jan. 16, 1964.)*

In the roasting of pyrites, three important types of reaction occur: oxidation of the sulfide, sulfur dioxide and metal sulfate formation and decomposition, and formation of ferrite compounds. With practically all metal sulfides, the oxidation of the sulfide in a finely ground state will proceed at a satisfactory rate if temperature and oxygen concentration are high enough. In some cases, such as the roasting of zinc sulfide, a catalyst may be needed to speed up the rate of reaction. The metal sulfate/oxide equilibrium may be difficult to determine in the sulfate formation and decomposition. An approximate solution may be attained by use of a free energy diagram. Although there is little known on ferrite formation, it may be regarded as a qualifying effect on the sulfate/oxide equilibrium.

35556 **APTIC NO. 59166**

Newhall, H. K. and E. S. Starkman

THERMODYNAMIC PROPERTIES OF OCTANE AND AIR FOR ENGINE PERFORMANCE CALCULATIONS. *Society of Automotive Engineers, Inc., New York, Digital Calc. Engine Cycles, Proc., 1963 (?), p. 38-48. 34 refs.*

A digital computer, a special program, and new thermodynamic data were used to recalculate and extend the scope and range of the classic combustion gas charts of Hottel and coworkers. A series of hydrocarbon and nonhydrocarbon fuels was treated over a range of air/fuel ratios, with temperatures up to 7200 R and pressures up to 15,000 psia. The resulting charts for isooctane at four mixture ratios from 20% lean to 40% rich are presented. Auxiliary charts for inducted mixture properties determination and a set of sample calculations are also included. Throttled and unthrottled Otto cycle analysis is given. (Author abstract modified)

35557 **APTIC NO. 59032**

Patterson, D. J. and Gordon Van Wylen

A DIGITAL COMPUTER SIMULATION FOR SPARK-IGNITED ENGINE CYCLES. *Society of Automotive Engineers, Inc., New York, Digital Calc. Engine Cycles, Proc., 1963 (?), p. 82-91. 34 refs.*

A comprehensive cycle analysis was developed for four-stroke, spark-ignited engines, and the indicated performance of a single cylinder was computed. The step-wise cycle calculations were made with a digital computer. This analysis took into account mixture composition, dissociation, combustion chamber shape, flame propagation, heat transfer, piston motion, engine speed, spark advance, manifold pressure and temperature, and exhaust pressure. A correlation occurred between calculated and experimental performance for one engine at a particular operating point. The calculated peak pressure was 10% lower and the thermal efficiency 0.8% higher than the measured values. This is a valid approach for predicting spark ignition engine cycle behavior and the effects of changing operating variables. It also offers great potential in the study of the importance to the engine cycle of phenomena such as turbulence, heat transfer, and the influence of combustion chamber shape. (Author abstract modified)

35558 **APTIC NO. 59031**

Strange, F. M.

AN ANALYSIS OF THE IDEAL OTTO CYCLE, INCLUDING THE EFFECTS OF HEAT TRANSFER, FINITE COMBUSTION RATES, CHEMICAL DISSOCIATION, AND MECHANICAL LOSSES. *Society of Automotive Engineers, Inc., New York, Digital Calc. Engine Cycles, Proc., 1963 (?), p. 92-106. 34 refs.*

The Otto cycle is theoretically analyzed considering the effects of dissociation, finite reaction kinetics, and irreversibilities such as heat transfer and mechanical friction on cycle performance and efficiency. The analysis is a highly flexible tool for investigating the complex relationships among engine variables. The mathematical model and the accompanying computer program offer a substantial computational advantage over the previous methods that employ charts and graphs and require a large number of manual calculations. Also, the ability of this scheme to consider the effects of heat transfer and other irreversibilities considerably increases the value of the results. Appendicies present the computer code, solution of thermochemical equations, thermochemical data, and consideration of knocking combustion. (Author abstract modified)

1939

35559 **APTIC NO. 58722**

Dudley, H. C. and J. M. DallaValle

A STUDY OF THE ODORS GENERATED IN THE MANUFACTURE OF KRAFT PAPER. *Paper Trade J., 108(24):30-33, June 1939. 4 refs. (Presented at the Technical Association of the Pulp and Paper Industry, Annual Meeting, New York, Feb. 20-23, 1939.)*

Three obnoxious odors result from processes being conducted in the manufacture of kraft paper: hydrogen sulfide, volatile sulfur compounds, large quantities of chemical smoke containing sodium sulfate, sodium sulfide, and large quantities of carbon and organic materials. The amount of H2S released from the plant is so small that it does not cause any odor. Although the odor of organic sulfur vapors is very disagreeable at the point of release, the quantity of these vapors is not sufficient to cause odors at any great distance from the plant. The greatest and the major contributing factor to the odors arising from the plant within a mile or more is due to the vast amount of smoke blown from the stacks. This smoke is of low temperature and soon reaches the ground, and is spread over an area of several square miles. There are several methods for controlling these odors. All vapors and gases from the turpentine condenser should be passed under boiler fires so that they will be completely oxidized. Also, electrical precipitators should be used to prevent an excess of chemical smoke.

CONTROL METHODS

1974

35560 **APTIC NO. 58984**

Arnold, Orland M. and Carlo A. Vancini

APPARATUS FOR CLEANING GASES. *(Peabody Engineering Corp., Stamford, Conn.) U. S. Pat. 3,789,585. 9p., Feb. 5, 1974. 10 refs. (Appl. June 23, 1971, 36 claims).*

A gas cleaning apparatus which has no moving parts or small passages or ports (which would tend to become clogged during use) is described. The gas stream is passed through an annular gas washing zone, a liquid spray from a fixed nozzle is passed radially outward through the gas stream in advance of the throat to remove suspended matter, a reservoir collects the droplets and suspended matter, and a dryer unit receives the gas from which the matter has been so removed. The drying unit includes a slotted plate having baffles and deflectors for collecting and removing the liquid droplets. This apparatus is efficient under various conditions of throughput and with various materials and is suited for continuous operation without shutdown for maintenance. The kinetic energy of a liquid spray from a stationary nozzle or the gas velocity from a venturi section is utilized to separate components from the input gas.

35561 **APTIC NO. 59220**

Bendixen, T. W. and G. L. Huffman

IMPACT OF ENVIRONMENTAL CONTROL TECHNOLOGIES ON THE ENERGY CRISIS. *In: News of Environmental Research in Cincinnati. Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center. 8p., Jan. 11, 1974. 12 refs.*

The impact of environmental control technologies on the energy crisis is examined. Four major environmental control practices exemplify the magnitude of the impact on energy demand: emission control for automobiles; sulfur dioxide control for power plants; municipal wastewater treatment; and solid waste collection and disposal. The energy required to operate the last three control processes would be only 1.04% of today s total demand for the United States, assuming that all of the Nation s power plants have SO2 scrubbers, all municipal solid waste is properly collected and landfilled, and all municipal wastewaters are treated to the tertiary level. The 10% average loss in fuel economy due to first-generation control devices required for emission control for automobiles should very nearly be recouped in the 1975 model year; engine modifications compatible with the new catalytic converter emission control devices should make this possible. (Author summary modified)

35562 **APTIC NO. 59329**

Bickelhaupt, Roy E.

ELECTRICAL VOLUME CONDUCTION IN FLY ASH. *J. Air Polluton Control Assoc., 24(3):251-255, March 1974. 14 refs.*

Resistivity and unsophisticated transference experiments were conducted at temperatures above 200 C. Six commercially produced fly ashes having similar overall chemistry but differing significantly in concentrations of alkali metals and alkaline earths were used. Test specimens were fabricated by pressing and sintering the ash into self-supporting discs. An Arrhenius equation was used to interpret the resistivity-temperature relationship. From the lack of deviation in experimental activation energy among the ashes the same conduction mechanism prevailing in each was shown. The quantity of electricity conducted was proportional to a mass transfer and lithium and sodium ions migrated. Resistivity was inversely proportional to the combined Li and Na concentration. The volume conduction process was controlled by an ionic mechanism in which Li and Na are the principal charge carriers. The overall conduction process involving specimens and electrodes was interpreted using the results of recent fundamental research on silicate glasses. (Author abstract)

35563 **APTIC NO. 58509**

Bourgeois, Sidney V., Jr., Frank R. Groves, Jr., and Albert H. Wehe

ANALYSIS OF FIXED BED SORPTION: FLUE GAS DESULFURIZATION. *Am. Inst. Chem. Engrs. J., 20(1):94-103, Jan. 1974. 12 refs.*

Temperature and concentration profiles of flue gas desulfurization in an adiabatic fixed bed reactor were obtained by solution of coupled nonlinear differential equations which described transient operation of the reactor. The unreacted-shrinking core mechanism described the multiple, irreversible, exothermic gas-solid reactions. Numerical integration was accomplished by a predictor corrector scheme which was programmed in Fortran IV language. The influence of kinetic parameters, heat and mass diffusivities within pellets, temperature variation of properties, gas velocity, bed and particle dimensions, inlet gas temperature and composition, and initial bed temperature on reactor performance were studied for SO2 removal by fixed beds of copper oxide. Comparison with commercial reactors was in qualitative agreement. The removal of SO2 from flue gas was feasible in a fixed bed reactor if pellet diameters were smaller than 6.4 mm, inlet flue gas temperatures were greater than 400 C, and initial bed temperatures exceeded 440 C. Temperature rises of approximately 100 C and breakthrough times of about 20 min could be expected. (Author abstract modified)

35564 **APTIC NO. 58518**

Burton, Robert S. III and Richard C. Bailie

FLUID BED PYROLYSIS OF SOLID WASTE MATERIALS. *Combustion, 45(8):13-19, Feb. 1974. 15 refs.*

Fluidized bed pyrolysis of solid waste material can be used to produce energy which can be reused. In an oxygen-free atmosphere, the incineration of solid wastes converts municipal waste to products with a potential positive energy contribution, rather than to carbon dioxide. The gaseous fuel produced gives off little air pollution, is ash free, is relatively cheap, and has a potential market as a fuel. The pyrolysis process is described. compositions for various fuels and solid waste components as C6HxOy are given, and the experimental equipment for a pilot plant pyrolysis facility are described. Various solid waste materials were studied. Municipal solid waste has a relatively high H/C ratio when compared with ordinary solid fuels, and is potentially attractive for the production of fuel gas. Relatively high conversions (above 70%) of municipal solid waste to low molecular weight gases could be achieved in a fluidized bed. Pyrolysis operating conditions and results, solid waste feed analysis, and produced pyrolysis gas analyses are given for different types of waste material. The faster the heating rate, the better the gas production and the gas phase thermal efficiency.

35565 **APTIC NO. 58961**

Carr, Norman L. and Donald L. Stahlfeld

PROCESS FOR INITIAL REMOVAL OF SULFUR COMPOUNDS FROM GASEOUS HYDROCARBON FEEDSTOCKS BEFORE REMOVAL OF ARSENIC THEREFROM. *(Gulf Research and Development Co., Pittsburgh, Pa.) U. S. Pat. 3,789,581. 6p., Feb. 5, 1974. 6 refs. (Appl. April 27, 1972, 15 claims).*

Removal of sulfur compounds which are traditionally found in conjunction with arsenic in petroleum feedstreams during refining markedly increases the As loading of metal oxide sorbents before breakthrough occurs. The present invention provides a chemisorptive process for reducing the As content of a gaseous hydrocarbon stream by contacting the stream with copper or an oxide of Cu or lead dispersed upon a supporting material. The improvement comprises first rendering the stream free of sulfur compounds, essentially hydrogen sulfide. When Cu or CuO is employed, the dispersed supported Cu or CuO should have an oxygen uptake value of at least 5 and preferably at least 40. (Oxygen uptake value is a measure of the degree of dispersion of the sorbent on its support, expressed as ml of oxygen/g Cu. The procedures for determining this value for a particular sorbent are given). (Author summary)

35566 **APTIC NO. 59314**

Cheng, L., J. E. Emmerling, and T. F. Tomb

COLLECTION OF AIRBORNE COAL DUST BY STEAM. *Pittsburgh Mining and Safety Research Center and Pittsburgh Field Health Group, Pa., Bureau of Mines Rept. of Investigations 7819, 17p., 1974. 13 refs.*

Laboratory investigations of the effectiveness of low-pressure steam and a steam-water spray sequence for the collection of airborne respirable (less than 10 micron) coal dust were performed. Comparison of the results with those from previous investigations employing water spray alone indicated that the use of steam in a steam-spray sequence increased the collection efficiency by about 14% over that obtained by water spray alone. The use of steam, however, does not appear to be an attractive approach for collecting airborne dust in underground coal mining operations since it requires the cooling of the steam-dust mixture in order to achieve condensation of the steam. (Author abstract modified)

35567 **APTIC NO. 59122**

Crossland, Janice

CARS, FUEL, AND POLLUTION. *Environment, 16(2):15-20, 25-27, March 1974. 13 refs.*

Automobile pollution control is reviewed, including add-on devices to present cars and the development of alternative, less-polluting engines. The impetus for the development of clean engines comes from the U. S. Clean Air Act which has set up standards for the emission of nitrogen oxides, hydrocarbons, and carbon monoxide. Methods to reduce internal combustion engine emissions include decreased compression ratios, lean air/fuel ratios, positive crankcase ventilation valves, exhaust gas recirculation, and catalytic converters. Catalytic converters have been criticized since they may deteriorate, reduce fuel economy, and cause additional metal pollution. The Clean Air Act has thus been the subject of controversy centered on the effectiveness of catalytic converters. Because of their fuel economy, there has been a trend toward lightweight, smaller cars. Rotary piston, stratified charge, Rankine (steam), gas turbine, diesel, and Stirling engines are being studied as low-polluting engines. By changing fuel composition, emissions can also be reduced; methane, methyl alcohol, propane, and hydrogen are being studied as fuels. The future production of low-polluting engines will depend on their technical feasibility, the willingness of the automobile engine to change their entire manufacturing process, the willingness of the government to spend money on research, and the ability of the government to secure industry cooperation.

35568 **APTIC NO. 58986**

Earl, Christopher B. and Fred Hughes

PROCESS FOR RECOVERING SULFUR DIOXIDE FROM GASES. *(Wellman-Lord, Inc., Lakeland, Fla.) U. S. Pat. 3,790,660. 7p., Feb. 5, 1974. 3 refs. (Appl. Feb. 22, 1971, 21 claims).*

An improvement in a sulfur dioxide removal process is reported wherein an SO2-containing gas is contacted with an aqueous absorbing solution of a metal sulfite, e.g., sodium sulfite, to yield a spent absorbing solution of metal bisulfite. The latter is decomposed to produce the sulfite, SO2, and water, with H2O and SO2 being evaporated and sulfite being precipitated from the solution. The decomposition is conducted while adding heat to the material undergoing decomposition by the use of indirect heat exchange between the material which is passed through the tubes of the heat exchanger and a heat-supplying medium in contact with the exterior surfaces of the tubes. The operation is characterized by the presence of at least 25 wt% undissolved solids in the material undergoing decomposition, preferably about 30 to 50 wt%. A portion of the material undergoing decomposition and containing sulfite can be recycled to the absorption step to serve as a source of aqueous absorbing solution. Preferably, this recycle stream is formed by adding water to a portion of the material undergoing decomposition without separation of significant amounts of undissolved solids. (Author abstract)

35569 **APTIC NO. 59114**

Fishel, Norman A., Richard K. Lee, and Frederick C. Wilhelm

POISONING OF VEHICLE EMISSION CONTROL CATALYSTS BY SULFUR COMPOUNDS. *Environ. Sci. Technol., 8(3):260-267, March 1974. 10 refs. (Presented at the American Chemical Society, National Meeting, 165th, Dallas, Tex., April 1973.)*

The effects of sulfur combustion products on particulate base metal vehicle emission control catalysts were studied. Some of the factors controlling the degree and rate of deactivation of one type of exhaust gas control catalyst, namely, copper-chromium alumina, are discussed. Data are presented which show how sulfur alters the chemical composition of these catalysts; how sulfur-poisoned catalysts may be regenerated in situ; and how low levels of sulfur accumulation on the catalyst are more detrimental to catalyst performance than small accumulations of lead or phosphorus. Under certain automotive operating conditions, sulfur poisoning can be minimized to the point that copper-chromium alumina catalysts offer the potential to meet 1976 Environmental Protection Agency hydrocarbon and carbon monoxide standards for 50,000 miles. Emissions from a slave vehicle, using one such catalyst after prior use for 52,000 vehicle miles on fuel containing sulfur, were 0.34 and 3.16 g/mi of HC and CO, respectively, using the 1975 EPA test procedure. (Author abstract)

35570 **APTIC NO. 58971**

Franz, Rudolph J., John S. Freismuth, and Nello L. Benedetti

EMISSIONS REDUCTION VACUUM CONTROL VALVE. *(Eaton Corp., Cleveland, Ohio) U. S. Pat. 3,789,811. 7p., Feb. 5, 1974. 8 refs. (Appl. Nov. 3, 1971, 10 claims).*

The patented device is a spark advance vacuum control valve arranged to reduce the emission of noxious gases from the internal combustion engines of automotive vehicles at different operating cyles. A solenoid energized by an electric switch in association with the transmission operates a valve effective to vent the distributor to the atmosphere as the engine is started and the transmission is shifted into high gear. When the transmission is in high gear, the solenoid is deenergized to connect the distributor to effect advance of the spark by carburetor vacuum. A manifold port, distributor port, and vent port lead into the valve housing through a wall of the housing, while the carburetor port is at an end of the valve housing. A valve chamber with the housing communicates with the manifold vacuum port, the distributor port, the vent port and the carburetor vacuum port under the control of a thermally responsive valve. The thermally responsive valve is operated by overheating of the engine to advance the spark by manifold vacuum and increase the speed of the engine. (Author abstract)

35571 **APTIC NO. 59306**

Fuller, Martin J. and Malcolm E. Warwick

LOW-TEMPERATURE CATALYTIC REDUCTION OF NITRIC OXIDE BY CARBON MONOXIDE ON SNO2-CUO GELS. *Chem. Commun., no. 2:57-1974. 5 refs.*

The low-temperature catalytic reduction of nitric oxide by carbon monoxide on tin oxide-copper oxide gels was investigated with a view to automobile exhaust purification. After thermal activation at 450 deg, coprecipitated SnO2-CuO gels, particularly those having a Cu:Sn atomic ratio of between 0-5.1 and 0-6:1, show high activity and high selectivity for nitrogen formation at low temperature (150 deg) in the catalytic reduction of NO with CO compared with a commercial barium-promoted copper chromite catalyst. (Author summary modified)

35572 **APTIC NO. 59115**

George, Z. M.

KINETICS OF COBALT-MOLYBDATE-CATALYZED REACTIONS OF SO2 WITH H2S AND COS AND THE HYDROLYSIS OF COS. *J. Catalysis, 32(2):261-271, Feb. 1974. 16 refs.*

Important Claus sulfur recovery process reactions were studied over a commercial cobalt-molybdate catalyst to determine thermodynamics, reaction rates, and reaction mechanisms. The reactions were: sulfur dioxide + 2 hydrogen sulfide reversible reaction yields 2 water + 3/xS sub x; SO2 + 2 carbonyl sulfide reversible reaction yields 2 carbon dioxide + 3/xS sub s; and COS + H2O reversible reaction yields CO2 + H2S. At 250 C, which is close to the operating temperature for Claus catalytic reactors, the rate constants for the above reactions were 75:1:5. Considerable irreversible adsorption of SO2 and H2S on the catalyst was observed. Kinetically, all reactions were similar in that the strongly adsorbed reactant (SO2 and H2O) was zero order and the other reactant (H2S and COs) was first order. The H2S-SO2 reaction (Claus reaction) appeared to be diffusion-controlled with an activation energy of 5.5 kcal/mole. No poisoning by CO2 was observed for the COS reaction. (Author abstract modified)

35573 **APTIC NO. 58889**

Grantham, John B.

FOREST RESIDUE: A FORGOTTEN SOURCE OF ENERGY. *Paper Process., 10(2):17-20, Feb. 1974. 3 refs.*

The benefits of residue use can be significant and far-reaching but public sharing of the cost of residue use will be required if enviornmental goals are to be met. Ultimately, the cost of environmental controls must be balanced by the benefits as perceived by the public. The public benefits of using logging residues include: reducing the visible air pollution from slash burning, improving the appearance of logged land, providing better access for reforestation and land management, and adding to the nation s energy and raw material supplies. These benefits must be balanced against a high cost of collecting and transporting logging residue and the required capital investment in new facilities such as power boilers, or fuel sizing and drying equipment. If the entire 8.5 million tons of logging and unused mill residue generated annually in California were diverted to electric power generation, this would provide an additional 9 million megawatt hr of 7.5% of the state s 1970 electric consumption. Municipal refuse is potentially an additional source of power. In addition to the public s garbage, there are agricultural and commercial residues accumulating at better than 45 million dry tons/yr.

35574 **APTIC NO. 58839**

Horino, S.

POLLUTION FREE BOILER COMBUSTION.

(Boira no mukogai nensho). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 41(1):1-25, Jan. 1974. 9 refs.

Control of dust, sulfur dioxide, and nitrogen oxides emitted from industrial boilers is discussed. If the capacity of a residual oil-fired boiler exceeds 40 tons/hr, a dust collector or process modification is required to conform to present emission standards. Control of acid smuts and fumes is difficult in boilers that have variable loads or are frequently switched on and off. Emission of SO2 can be controlled by fuel desulfurization or stack gas cleaning. Denitrization of boiler stack gases can only be achieved by process modification. Combustion technology includes two-stage combustion, recirculation, offset firing, lowering the air temperature, or a combination of these methods. Fuel substitutions are considered.

35575 **APTIC NO. 59116**

Hudson, John L., Edwin H. Johnson, David F. S. Natusch, and Robert L. Solomon

HYDROGEN SULFIDE ADSORPTION BY MANGANESE DIOXIDE AND ACTIVATED CARBON.

Environ. Sci. Technol., 8(3):239-243, March 1974. 18 refs.

In many cases, hydrogen sulfide can be effectively removed from air by adsorption on solid filters. The adsorption of H2S on a solid filter of manganese oxide deposited on the surface of wood sawdust and on activated carbon was therefore tested. The efficiencies of H2S removal were measured as functions of H2S concentration, flow rate, particle size, relative humidity, and bed depth. The outlet concentration of H2S from a bed of MnO2-sawdust was considerably below that from a bed of activated carbon of the same volume and the same conditions, often by more than an order of magnitude. The useful capacity of the MnO2-sawdust bed (the amount of H2S which can be adsorbed before the efficiency drops below a predetermined value) can be greater than four times that of activated carbon. The efficiency of the MnO2-sawdust had a maximum at a relative humidity of 80%. Both Mn-O2 sawdust and activated carbon were inefficient below 20% relative humidity. (Author abstract modified)

35576 **APTIC NO. 58967**

Huntington, Richard L.

MULTIPLE COMPARTMENT PACKED BED ABSOPBER-DESORBER HEAT EXCHANGER AND METHOD.

(Assignee not given.) U. S. Pat. 3,791,102. 9p., Feb. 12, 1974. 7 refs. (Appl. June 10, 1971, 7 claims).

The invention is a multiple compartment packed bed absorber-desorber heat exchanger. The absorber-desorber heat exchanger includes at least one set of upper and lower compartments containing suitable tower packing. Gas inlets, gas outlets, and liquid distributors are provided for each packed bed chamber. The gas flows in the upper and lower compartments are isolated from each other by a liquid seal. The upper and lower packed beds are wetted by a common irrigation liquid or heat exchange fluid which gravitates downward through the packed beds to a sump and recycling pump. The dual packed beds can be operated to absorb and desorb gases, to concentrate gaseous contaminants, or to transfer heat and to condense vapors. Preferably, the dual packed bed chambers are of modular construction. The packed bed wet fume scrubber recovers heat from the exhaust gases, concentrates gaseous contaminants, and reduces vapor plume formation.

35577 **APTIC NO. 58781**

Inaba, Hideya

FLUE GAS DENITRIZATION BY CATALYTIC REDUCTION.

(Sesshoku kangenho ni yoru haien dassho). Text in Japanese. Netsu Kanri to Kogai (Heat Management Pollution Control), 26(1):41-47, 1974.

The principles, chemical mechanism, and characteristics of the Hitachi Shipbuilding Co. denitration system pilot plant are discussed and flowsheet and performances charts are presented. Four types of catalysts, non-selective (A and B), semi-selective (C), and selective (D) were developed for various types of flue gases. A and B use the reduction agents of carbon monoxide, hydrogen, and methane, and they tend to lose activity by the existence of sulfur dioxide; best results are obtained by first desulfurizing flue gas down to 10 ppm; when H2 is present, the quantity of oxygen must be checked for explosion possibility, and when residue O2 is present, the catalytic temperature must be kept lower than 600 C. The optimum temperature of B is 50 C lower than A. Catalyst C shows no effect of SO2. Since this catalyst uses the same reduction agents as A and B, the protection from H2 and O2 is the same as A and B. The amount of catalyst required is the same as A, but thy price is higher than A. Catalyst D is not affected by SO2; the reaction temperature range is narrow, and the price is the same as C. The reduction agent is ammonia. By adjusting reaction conditions carefully, all catalysts can produce denitration to less than 10 ppm. But the length of catalytic life is unknown at this stage.

35578 **APTIC NO. 58378**

Kurosawa, Keiji

NITROGEN OXIDES ELIMINATION BY A WET METHOD.

(Shisshikiho ni yoru chisso sankabutsu jokyo). Text in Japanese. Netsu Kanri to Kogai (Heat Management Pollution Control), 26(1):49-56, 1974.

The main types of wet and dry methods of denitration are discussed and a new type of wet denitration is introduced. The MON method was developed by Mitsubishi Metal Mining, Professor Okabe, and Nihon Chemical, and takes the initial of the three parties. The process utilizes an alkaline solution of manganate as the absorbent (for instance potassium permanganese dissolved by caustic potash solution), and eliminates nitrogen oxides in industrial flue gases most successfully. A small scale pilot plant with 300 N cu m/hr of treatment gas successfully eliminated more than 90% of NOx, down to less than 100 ppm. The characteristics of this process are as follows: recovery of nitric oxide, which has been considered unrecoverable, on an industrial scale; simultaneous elimination and recovery of sulfur dioxide; manganese dioxide in the absorbent can be recovered and reused as manganate; nitric acid alkali created in absorbent liquid waste can be recovered and sold as fertilizer; the total process is achieved in a closed circuit and there is no secondary pollution; this system is adaptable for a wide range of concentration of NOx. The chemical mechanism, a diagram, the cost analysis for operation, construction, maintenance, and comparison with desulfurization cost are presented.

35579 **APTIC NO. 58785**

Kurosawa, Keiji

STACK GAS DESULFURIZATION. *(Haien datsuryu ni tsuite). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 3(1):66-73, Jan. 1974.*

The present state of the stack gas desulfurization technique as practiced in Japan, the cost of stack gas desulfurization, the problems of small desulfurization systems, the relationship between fuel prices and sulfur content, and nitrogen oxide control methods are discussed. The main systems now utilized are: the sodium sulfite recovery method and the MKK caustic soda circulation method, both of which utilize caustic soda as the absorbent in the spray tower, packed tower, TCA, Barco scrubber, or jet scrubber. The Wellman-Lord sodium method utilizes sodium sulfite as the absorbent in the seep tray tower; the Showa Electric method utilizes sodium sulfite in the vertical venturi; the Bankside method, Mitsubishi Heavy Industries Gypsum method, and Barco method utilize calcium hydroxide in the frame packed tower, spray tower, or Barco scrubber; the Chemico, Grillo and Kawasaki Heavy Industries magnesium oxide method utilize magnesium hydroxide in the jet scrubber, spray or multi-jet scrubber; the Wellman-Lord method utilizes potassium sulfite in the seep tray tower; the Japan Steel Pipe method and Mitsubishi Heavy Industries ammonia method utilizes in the Kobe scrubber or MCF scrubber; the Chiyoda Thoroughbred method utilizes dilute sulfuric acid in the packed tower; the UOP sulfoxyl method utilizes a special absorbent in a low differential pressure venturi and TAC; the Lurgi sulfacid method utilizes activated carbon in a horizontal tank. For controlling nitrogen oxides from larger boilers, tangential firing, exhaust gas circulation, multi-step combustion, and controlling of overfire air are effective; spraying of the burner by low pressure steam or water jet can also be effective, but all these methods are not practical for small boilers. Changing the fuel to city gas, LPG, or kerosene will solve the problems of sulfur dioxide and NOx, and the installation cost is very small. Although the fuel cost will increase considerably, in the long run, the use of these fuels can be much more profitable.

35580 **APTIC NO. 59129**

Kurosawa, Keiji

BOILERS FOR URBAN HEATING, AND FLUE GAS DESULFURIZATION. *(Toshi danboyo boira to haien datsuryu). Text in Japanese. Kukichowa to Reito (Air Conditioning Refrig.), 14(1):209-215, Jan. 1974.*

The economics of flue gas desulfurization is discussed. The Wellman-Lord stack gas desulfurization plant is designed to handle 620.000 N cu m/hr of flue gases and achieves a 90% efficiency when processing boiler gas containing 1500 ppm sulfur dioxide from a boiler fueled by heavy oil with 3% sulfur. At the end of 1974, half the number of Wellman-Lord plants now under construction in Japan will be completed and the total treatment capacity will be 1.5 billion N cu m/hr. Combustion gases from an annual consumption of 8-9 million kl of heavy oil will be desulfurized by these plants. The installation and running costs of a flue gas desulfurization plant are discussed. With a large-scale plant, the cost is about $9000 per ton of steam generation capacity of the boiler. Costs are reviewed in relation to the amount of sulfur in the stack gas. Tangential firing, recirculation, and multi-stage combustion are reviewed as means to control nitrogen oxides.

35581 **APTIC NO. 58968**

Kusano, Kazuto and Kenji Miyata

METHOD OF TREATING WASTE GAS ARISING FROM INDUSTRIAL FACILITY. *(Japan Gasoline Co., Ltd., Tokyo (Japan)) U. S. Pat. 3,791,103. 4p., Feb. 12, 1974. 7 refs. (Appl. June 30, 1972, 6 claims).*

The invention consists of the provision of an open bypass duct leading directly from the facility s outlet for waste gas to the exhaust system and a duct equipped with a blower and waste gas treating equipment which branches off the bypass duct to lead to the exhaust system. The blower works to pass at least the whole quantity of waste gas through the waste gas treating equipment. The method is applicable to waste gas containing sulfur dioxide, hydrogen sulfide, nitrogen oxides, carbon disulfide, and gaseous solvents from facilities such as combustion furnaces, reactors, drying equipment, or melting furnaces. The waste gas treating equipment can be SO2 eliminators, dust catchers, solvent adsorption reclaimers, or deodorizers. This method eliminates the need for expensive, inefficient flowmeters.

35582 **APTIC NO. 59485**

Lorenzi, L., Jr.

PLANT DEVELOPMENT FOR CHEMICAL DESULFURIZATION OF COAL. *Preprint, American Chemical Society, 16p., 1974. 1 ref. (Presented at the American Chemical Society, Meeting, Los Angeles, Calif., 1974.)*

The Meyers Process was developed for cleaning coal by removing the pyritic sulfur in coal while maintaining the structural integrity and physical characteristics of coal s organic matrix. The coal is leached with aqueous ferric sulfate solution to convert the iron pyrite into free sulfur and dissolved iron sulfate. These reaction products are formed in a molar ratio of 1.5:1 sulfate:sulfur. The schematic flow of the process, slurry preparation and reaction sections, design of the plant, and plant economics are discussed. The cost of the Meyers process is $0.30/million Btu.

35583 **APTIC NO. 58985**

Mahoney, William P.

METHOD FOR CONTROLLING FURNACE EMISSIONS. *(Ball Corp., Muncie, Ind.) U. S. Pat. 3,789,628. 3p., Feb. 5, 1974. 2 refs. (Appl. Dec. 23, 1971, 5 claims).*

A method for scrubbing glass furnace exhausts is presented. An aqueous solution of sodium silicate is sprayed into the hot gases as they are exhausted through the furnace stack. When introduced into the hot furnace gases, the water tends to evaporate from a droplet into the exhaust stream. The sodium silicate then forms a small, sticky sphere with physical and chemical affinity for the more objectionable of the furnace emissions. These include nitrogen oxides, sulfur oxides, and particulate matter. In moving through the furnace emissions, the sticky sphere collects the more objectionable constituents. Then, as the remaining water is removed from the sphere, it forms a prill (hollow sphere). The precipitated prill is collected and recycled back into the glass batch materials.

35584 **APTIC NO. 59312**

Marier, P. and H. P. Dibbs

THE CATALYTIC CONVERSION OF SO2 TO SO3 BY FLY ASH AND THE CAPTURE OF SO2 AND SO3 BY CAO AND MGO. *Thermochimica Acta, 8(1,2): 155-165, Jan./Feb., 1974. 21 refs.*

The formation of sulfur trioxide from sulfur dioxide and oxygen is capable of catalysis by iron oxide in the fly ash from a coal-fired boiler. The amount of SO3 produced is dependent on the iron oxide content of the fly ash and on the oxygen concentration of the gas stream. Carbon in the fly ash significantly reduces the formation of SO3. The removal of SO2 from a gas stream by calcium oxide and magnesium oxide is enhanced by the catalytic conversion of the SO2 to SO3, as SO3 is more easily captured than SO2 by these oxides. The formation of SO3 and its removal from the gas stream depend upon the reaction temperature, the oxygen concentration of the gas stream, and the flow rate of the gas. (Author abstract modified)

35585 **APTIC NO. 58812**

Matsuo, Seiji

DISPOSAL METHOD OF ACID DUST COLLECTED BY DUST COLLECTOR FROM HEAVY OIL-BURNING FURNACE FLUE GAS WITH AMMONIA GAS INJECTED. *(Juyu nenshoro ni okeru endonai haigasu-chu ni anmoniagasu o chunyu shite shujinki de hoshu shita sansei dasuto no shoriho). Text in Japanese. (Matsuo, Seiji, Suita (Japan)) Japan. Pat. Sho 49-7317. 4p., Feb. 19, 1974. (Appl. Feb. 9, 1970, 1 claim).*

A mixture of air and ammonia gas is injected into heavy oil combustion flue gas to control emission of acid smuts. The electrical resistance of dust particles is increased and the electrostatic precipitator efficiency is increased. The acid dust collected from flue gas treated by this method has a coating of acidic ammonium sulfate around each particle or particle aggregate. This dust is put into a vacuum tank in which a negative pressure of 400-500 mm desorbs the sulfur trioxide or sulfuric acid mist contained in the particulates. The completely reacted ammonium sulfate is used for fertilizer.

35586 **APTIC NO. 58845**

Matsuo, Seiji

CHARGE CONTROL SYSTEM OF ELECTROSTATIC PRECIPITATOR. *(Denki shujinki no kaden seigyo hoshiki). Text in Japanese. (Matsuo, Seiji, Suita (Japan)) Japan. Pat. Sho 49-7544. 4p., Feb. 21, 1974. (Appl. July 5, 1968, 1 claim).*

A new type of control system for electrostatic precipitators is described. Previously, 20-40 sec were required for the precipitator to return to normal operating conditions after the power supply was cut off for the extinction of the arc when flashover took place. Later variations eliminated this delay with an amplifier and a saturable reactor, but this modification added considerable cost. In the proposed system, the circuit consisting of the relay contact and the abnormal voltage control reactor are connected to the input side of the transformer of the electrostatic precipitator. Another relay contact which is provided for the shortcircuiting of the reactor is connected in parallel. When an abnormal voltage is generated, the abnormal voltage control reactor supplies the power to the precipitator. As the voltage of the precipitator reaches the required level, the second circuit is activated to shortcircuit the abnormal voltage control reactor and the voltage level returns to the rated voltage required for normal operation. The operation of the second circuit may be controlled by a timer which will automatically determine the time required for the precipitator to return to normal operating conditions.

35587 **APTIC NO. 58502**

Miyamoto, S., A. W. Warrick, and H. L. Bohn

LAND DISPOSAL OF WASTE GASES: I. FLOW ANALYSIS OF GAS INJECTION SYSTEMS. *J. Environ. Quality, 3(1):49-55, Jan.-March 1974. 17 refs.*

The steady state flow of gases in soils is analyzed mathematically from the view of land disposal of waste gases by absorption. Gas injection systems considered include ditches, buried pipes, and wells. The systems are compared on the basis of how effectively the power is used (power efficiency) and how uniformly the gas is distributed through soils (uniformity). Often the two criteria are in conflict, and systems giving a high power efficiency result in low uniformity. Gas injection by buried porous pipes appears to be more advantageous than ditch or well systems. (Author abstract)

35588 **APTIC NO. 58991**

Morel, Marcel and Lucien Lepareur

ANTI-POLLUTION SUPPLY DEVICE FOR INTERNAL COMBUSTION ENGINES. *(Assignee not given.) U. S. Pat. 3,789,817. 7p., Feb. 5, 1974. 5 refs. (Appl. April 28, 1972, 7 claims).*

Incomplete combustion of fuel in engines causes the release of pollutants through the exhaust. A device that provides for more complete combustion is presented here. The device consists of an air intake pipe, a main fuel supply pipe and an auxiliary fuel supply pipe. The main fuel pipe has a portion in the form of a frustoconical spiral disposed in a vaporization chamber heated by the exhaust gases of the engine. A thermostat is responsive to the temperature in the vaporization chamber and controls the supply of fuel above a given temperature in the chamber. The auxiliary fuel supply pipe is surrounded at least partly by an electric heating resistance and an auxiliary air intake pipe communicates with the air intake pipe. Control means are provided for heating the resistnace and allowing supply of auxiliary air and auxiliary fuel for starting the engine above a predetermined temperature in the heating resistance and so long as the given temperature of the vaporization chamber has not been reached. Precise ignition time and proper carburetion of the correct air-fuel ratio considerably reduce emissions.

35589 **APTIC NO. 59002**

Nagey, T. F., P. Mykolenko, M. E. Naylor, and F. J. Verkamp

A LOW EMISSION GAS TURBINE PASSENGER CAR? *Mech. Eng., 96(1):14-20, Jan. 1974.*

A state-of-the-art evaluation is presented concerning methods under study to reduce emission levels of the gas turbine so that it can become a candidate for further automobile propulsion. Today s turbine engines can meet the hydrocarbon and carbon monoxide regulations but exceed the allowable level for oxides of nitrogen by an order of magnitude. Redesign of the turbine engine combustor for reduction of NOx may allow the turbine to meet all the emission laws without any of the add-on devices required for the piston engine. The two critical parameters affecting NOx formation are primary zone temperature and residence time; primary zone temperature is the more important parameter to control in a practical size combustor. One of the more successful combustor designs has been the external recirculation combustor. Basic design features include: prevaporization of the fuel before the reaction zone, premix of the fuel and primary air before the reaction zone, and convection cooled combustor walls. Problems which must be solved before a combustor is practical for automotive gas turbine engines include: emission performance during ignition and during the initial low combustor inlet temperature warm-up period; emission performance during transient engine operation; marginal stability limits due to lean blow-out; emission performance sustainability during long life (100,000 mi) of operation; rapid response and exact control of the combustor variable geometry with engine operating conditions; and effect of manufacturing variability on emission performance. Hydrocarbon and carbon monoxide emissions are also discussed.

35590 **APTIC NO. 58993**

Nix, Thomas B.

REMOVAL OF FLUORIDES FROM GASES. *(Fuller Co., Catasauqua, Pa.) U. S. Pat. 3,790,143. 5p., Feb. 5, 1974. 1 ref. (Appl. July 31, 1972, 4 claims).*

Methods and apparatus for removing gaseous fluorides from gases evolved from an aluminum smelting furnace are described. Basically, the fluorides are removed by achieving intimate contact between finely divided particles of alumina and the fluoride-containing gases. This is achieved by feeding the particles of alumina into a stream of gases collected from the aluminum smelting furnaces countercurrent to the flow of gases. The particles of alumina adsorb the fluorides. The particles of alumina and adsorbed fluorides are then separated in a gas-solids separator, such as a cyclone, and the alumina may then be fed to the smelting furnaces. Prefereably, two stages are used. The gases supplied to the second or last cyclone in the direction of gas flow are supplied with new alumina countercurrent to the flow of gases. The alumina particles removed in this second cyclone are conveyed to the gas stream supplied to the first cyclone in the direction of gas flow. In a two-stage apparatus, these gases will be those evolved from the smelting furnace or recirculated or a portion may be recirculated and a portion conveyed to the smelting furnace. The gases separated in the first cyclone are conveyed to the second cyclone. This method eliminates the necessity to cool the effluents as with a baghouse.

35591 **APTIC NO. 58992**

Pinkerton, James David

DUEL COMBUSTION PROCESS FOR AN INTERNAL COMBUSTION ENGINE. *(Assignee not given.) U. S. Pat. 3,789,807. 8p., Feb. 5, 1974. 7 refs. (Appl. June 19, 1972, 22 claims).*

An internal combustion process in which fuel is twice combusted before leaving the system is described. Air is compressed in a low pressure cylinder with some of this compressed air being withdrawn and injected, with or without cooling, into a high pressure cylinder where it is further compressed and combusted with fuel in a fuel rich mixture. The exhaust gases from the high pressure cylinder are withdrawn from the latter and flowed into a reservoir chamber from which they are intermittently withdrawn and injected into the low pressure cylinder for mixture and combustion with the compressed air in the latter cylinder. The foregoing steps are repeated after the exhaust gases are purged from the low pressure cylinder. The primary advantage of the system is that hydrocarbons, nitrogen oxides, and carbon monoxide emissions are reduced. Furthermore, work is obtained from each of the cylinders, thereby improving the overall engine thermal efficiency. This invention avoids the previous pollution problems encountered with the use of a blowby pipe and catalytic oxidation.

35592 **APTIC NO. 58313**

Sadovskii, B. F., V. V. Gavrilov, F. Ya. Frolov, A. P. Bazarov, and I. V. Petryanov

SMALL-CLEARANCE SELF-CLEANING FTR FILTERS FOR MIST COLLECTION. *Intern. Chem. Eng., 14(1):140-141, Jan. 1974. 6 refs.*

The construction, operation, and maintenance features of filter units comprised of cartridges of ultra-fine glass fibers for the elimination of mists consisting of water, oil, and salt-solutions from gaseous streams are described. A filter typical consists of a housing to which an ultra-fine glass fiber (1.5 micron average diameter) is fastened; and the filtering element is enclosed within a tubular framework. An overflow tube which is connected to a hydraulic seal or a receiving vessel is provided for automatic discharge of the liquid collected by the filter. The thickness of the filter bed amounts to 10 mm, while the packing density of the fibers in the bed is 100 kg/cu m (porosity of 96%). Tests of the filters on mists of oil, water, and salt solutions have shown that the resistance under steady-state self-cleaning conditions is in the range of 80-120 mm mercury; while the efficiency is 95-99% or more, depending on the degree of dispersion of the mist. Mist loadings of up to 10 g/cu m and higher can be achieved.

35593 **APTIC NO. 59126**

Sasaki, Katsumi and Shinya Nagamine

THE MAIN POINTS IN MAINTENANCE OF DUST COLLECTOR -- ANALYSIS OF TROUBLE CAUSES AND THEIR CORRECTIVE MEASURES. *(Shujin sochi hoshu kanri no yoten -- Toraburu genin no bunseki to taisaku). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(3):72-78, March 1974.*

The main components of an electrostatic precipitator, a centrifugal separator, and a filter are described to facilitate maintenance and inspection. Possible causes of damages and pertinent corrective measures are discussed for each piece of equipment. Standard inspection procedures for each machine while in use and not operating are given.

35594 **APTIC NO. 59340**

Stenhouse, J. I. T.

THE INFLUENCE OF ELECTROSTATIC FORCES IN FIBROUS FILTRATION. *Filtration Separation (Purley), 11(1):25-26, Jan./Feb., 1974. 21 refs.*

Mathematical expressions are derived for the efficiency of collection of particles in fibrous filters due to an electrostatic mechanism in which either the particle or fiber or both are charged. The theory is based on the cellular model of flow through a filter and is in excellent agreement with published experimental data. An increase in the packing density of a filter has two effects. The streamline tortuosity is increased and causes an increase in collision efficiency due to interceptions and the fact that the particle is brought close to the fiber where the electrostatic forces are strongest. The electrostatic forces, however, will be effective over a shorter range, causing a reduction in the collision efficiency due to electrostatics. Calculations for the effect of filter packing density indicate that in the case of charged filters an increase in filter packing density will have little or no effect on the single fiber collision efficiency.

35595 **APTIC NO. 59130**

Suzuki, Shoichi

AIR FILTER. *(Kuki seijoki). Text in Japanese. Kukichowa to Reito (Air Conditioning Refrig.), 14(1):189-195, Jan. 1974. 4 refs.*

Building environmental control standards require that air conditioning provide 0.15 mg/cu m or less of suspended dust, 10 ppm or less of carbon monoxide 1000 ppm of carbonic acid gas, a temperature between 17 C and 28 C, a relative humidity between 40% and 70%, and an air flow of 0.5 m/sec or lower. Maximum allowable concentrations of some 50 toxic substances are listed. Air filters are used to meet these standards. Air filters suitable for continuous operation over an extended period of time are described. Rating methods of air filter performance, such as gravimetry and colorimetry, are discussed. A High Efficiency Particulate Air (HEPA) filter is used for a bio-clean room. High density filter elements make the pressure loss greater and slow the wind speed. An air filter used in an office building can be of larger capacity giving a medium efficiency.

35596 **APTIC NO. 58833**

Suzuki, Teruaki and Takakazu Minami

DUST COLLECTOR. *(Shujin sochi). Text in Japanese. (Hosakawa Powder Engineering Laboratory Co., Ltd., Osaka (Japan)) Japan. Pat. Sho 49-7542. 4p., Feb. 21, 1974. 1 ref. (Appl. Dec. 28, 1970, 1 claim).*

A buffer chamber is attached to a bag filter to reduce the impact of pressurized air during cleaning. Air is blown through the bag filter in a direction counter to the normal air flow to remove the accumulated dusts. This sudden impact shortens the life of the filter fabric, especially glass or non-woven fibers. The buffer chamber allows the cleaning air to flow through the bag filter at a steadily increasing rate, thus reducing wear on the fabric. A control valve allows adjustment of the pressure impact, and can incorporate an electromagnetic device controlled by timer for automatic operation.

35597 **APTIC NO. 58376**

Takasaki, Shoichi

FLUE GAS DENITRATION BY WET OXIDATION AND ABSORPTION. *(Shisshiki sanka kyushuho ni yoru haien dassho). Text in Japanese. Netsu Kanri to Kogai (Heat Management Pollution Control), 26(1):57-62, Jan. 1974.*

After several years of research work, a method of eliminating more than 90% of nitrogen oxides from glass furnace flue gas was developed using activated carbon and chlorous acid soda. This was developed industrially and after a long-term test with a 500 N cu m/hr pilot plant, a denitration rate of more than

95% became possible. In 1973, a full scale system was constructed, and with the air capacity of 62,000 N cu m/hr, a trial operation is in progress. The absorbent developed specially for this sytem is Fujinon-Ox which utilizes chlorine dioxide and other chlorine oxidizing agents. Nitric oxide is induced into nitrogen dioxide, and then reduced to nitrogen in a special absorption tower. Oxidizing time is less than one second and the reaction is complete. When 100% of NO is oxidized, 50% of NOx is eliminated; or 200 ppm of NO is changed into 100 ppm of NO2 by Fujinon-Ox and the rest of NOx is stabilized in the liquid as NO3. The tower is a special liquid-gas contact tower where NO2 is absorbed by liquid and stabilized. At the exit, the gas contains zero concentration of NO, less than 10 ppm of NO2, less than 5 ppm of SO2, no chlorine oxide, chlorine, or hydrogen chloride, 13% of carbon dioxide, 3.5% of oxygen, and 0.03 mg/N cu m of dusts. The cost for the entire installation including liquid waste treatment system is about $133,333 per treatment gas 10,000 N cu/hr within the range of 60,000-100,000 N cu m/hr. The running cost for 99% of desulfurization and more than 95% of denitration, including chemicals, electricity, manpower, and 7-year depreciation is about $13.3 per 1000 l of fuel oil.

35598 **APTIC NO. 59128**

Tono, Shunzo

AUTOMATIC DISPOSAL METHOD AND DEVICE FOR DUST CONTAINED IN TOP HOPPER EXHAUST GAS OF BLAST FURNACE. *(Yokoro rocho hoppa haiatsugasu-chu no dasuto jido haishutsu hoho oyobi sono sochi). Text in Japanese. (Ishikawa-Harima Heavy Industries Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 49-6445. 4p., Feb. 14, 1974. (Appl. March 18, 1970, 2 claims).*

An automatic dust disposal system for a blast furnace featuring easier disposal of the dust collected is described. Pipes connect the dust collection bins to a cyclone and a gravitational precipitator. Exhaust gas control valves, equalizing gas control valves, and dust feedback valves regulate the flow of contaminated and clean gases.

35599 **APTIC NO. 58560**

Waid, Donald E.

HOW TO DESIGN AIR POLLUTION CONTROL EQUIPMENT THAT WILL NOT BECOME OBSOLETE. *Combustion, 45(8):4-12, Feb. 1974.*

Metal coating oven effluent can be controlled by thermal incineration. However, certain compounds when oxidized sometimes form worse pollutants, such as hydrofluoric acid oxidized to chlorates or phosgene. A tunnel-type or line-type burner can be used to oxidize organic or carbon-bearing compounds for air pollution control. Extensive laboratory testing was carried out to determine the requirements for successful thermal incineration. The efficiency of thermal incinerators for removing CO and HC from paint drying and wire enameling oven stack gases was determined. Advantages of the thermal process include the fact that a thermal unit will not become obsolete no matter what future changes in codes take place, the performance of the thermal unit remains the same from the time of installation, it is relatively economical to install and operate, oxygen from the effluent is utilized for combustion in many cases, and the direct gas-fired thermal incinerator can be readily worked into an oven or the process heat requirement. Some successful methods of fuel economy include heat recovery, reduction in flow of effluent from the system, the use of heated effluent oxygen for combustion, and the most efficient possible design and operation of the thermal oxidizer.

35600 **APTIC NO. 58503**

Warrick, A. W. and S. Miyamoto

LAND DISPOSAL OF WASTE GASES: II. GAS FLOW FROM BURIED PIPES. *J. Environ. Quality, 3(1):55-60, Jan.-March 1974. 5 refs.*

Steady-state compressible gas flow in homogeneous soils from buried porous pipes were analyzed for the purpose of developing land disposal systems for waste gas absorption. Two different cases are considered: the ground surface partially covered by an impermeable barrier; and the surface corrugated with alternating ridges and valleys with the pipe buried under the ridges. The partial surface barrier provides a more uniform gas flow in soils than without it, but leads to an increase in the power required to inject gas at a given rate, especially when the pipe spacings are wide. Compared to an open level surface, the corrugated geometry results in a better gas distribution with little increase in power required and is probably the better system for injecting waste gas in nonstratified soils. (Author abstract)

35601 **APTIC NO. 59331**

Wu, Ming-Shian and Joseph T. Zung

THE ROLE OF MOLECULAR FORCES IN THE SCAVENGING OF AEROSOL PARTICLES. *Environ. Letters, 6(2):77-94, 1974. 17 refs.*

The effects of intermolecular forces on the collection efficiency of submicron aerosol particles are studied. Intermolecular forces provide a certain region as an absorbent surface in the vicinity of the drop. Numerical results were obtained for the cases of a water drop collecting silver chloride aerosols and a water drop collecting submicron cloud droplets. The collection efficiency depends mainly on the diffusion process. Calculations made here agree reasonably well with recent experimental results of Kerker for AgCl aerosols for the case of small drop. (Author abstract)

35602 **APTIC NO. 59168**

Tennessee Valley Authority, Muscle Shoals, Alabama

AGRICULTURAL USES OF FLUE DUST FROM PORTLAND CEMENT MANUFACTURE (1907-1973). *TVA Bibliography 1396, 5p., 1974. 59 refs.*

A bibliography on agricultural uses of flue dust from Portland Cement manufacture is presented. Chemical Abstracts (CA) was searched from 1907 through 1973, and the CA citation is included with the reference.

35603 **APTIC NO. 59275**

INCINERATION OF TOXIC GASES AND LIQUIDS. *(Incineration de gaz et de liquides toxiques). Text in French. Chim. Actualites, no. 1524:28-29, Feb. 1974.*

Experiments on the destruction of toxic liquids and gases by incineration in a standard Peabody Vortex incinerator are described. Kerosene, toluene, and phenol in methyl alcohol were atomized in a smoke flow produced by a smoke generator to maintain a kerosene, toluene, and phenol concentration of 2000 ppm in the flue gas. Incineration was done by natural gas as auxiliary fuel in a temperature range of 800-1000 C. The heat generated by kerosene, toluene, and phenol during their concentration from 2000 ppm to 5 ppm by incineration was 177 Mcal/h, 237 Mcal/h, and 257 Mcal/h, respectively. After a hold time of 0.395 sec, the phenol concentration was reduced to 1 ppm, and the flue gas contained 7% carbon dioxide, 2 ppm carbon monoxide, and 60 ppm nitrogen oxides. When employing an air excess coefficient of 75%, the NOx emission was reduced to 40 ppm, and practically no CO was emitted. A residue from adipic acid production, containing 17% adipic acid, 53% glutamic acid, 27% succinic acid, and up to 2% water, was incinerated in the same incinerator without auxiliary fuel, using a water vapor atomization burner. The NOx content of the flue gases in the chimney was below 40 ppm.

1973

35604 **APTIC NO. 59012**

Ackermann, Friedrich H.

HEAT-RECOVERY AT COMBUSTION. *(Waerme-Rueckgewinnung beim Verbrennen). Text in German. Planen-PruefenhInvestieren, 25(12): 75-76, 1973.*

A thermal afterburner for cleaning a waste air flow of 8000 cu m/hr polluted with phenol and cresol is described. The heat from the process is recovered for heating a galvanizing bath. As heat carrier, an organic medium with a temperature of 250 C is used. For heating the galvanizing bath independently from the afterburner, a natural gas-fired heater is connected in series with the afterburner. The waste air is drawn by a ventilator through a preheater where the temperature is raised to 250 C. The air enters the combustor tangentially. Through intense mixing of waste air and auxiliary fuel, combustion takes place rapidly on the smallest place. For reaching a reaction temperature of 800 C, about 165 to 185 cu m natural gas/hr are added. This reaction temperature guarantees a residual phenol concentration of less 0.2 mg/cu m. The air cleaned in the combustor is cooled in the waste air preheater to 710 C by convective counterflow heat exchange. In the waste heat recovery system, the temperature is further reduced to 340 C which corresponds to a heat recovery of 4.2 GJ/hr (1 Gcal/hr).

35605 **APTIC NO. 58905**

Adams, A. B., Jr.

AIR AND WATER POLLUTION CONTROL IN CRUDE TALL OIL MANUFACTURE IN THE PULP AND PAPER INDUSTRY. *J. Am. Oil Chemists Soc., 50(12):498-500, Dec. 1973. 4 refs.*

Air and water pollution control measures are reviewed for crude tall oil manufacture in the pulp and paper industry. Measures for air pollution control include the enclosing of all vessels that contain the black liquor from which tall oil is recovered; placing hoods over storage tanks, heat exchangers, and other liquor-containing vessels; and venting the hoods to a ductwork system to bring the off-gases to a central point for disposition. Typical devices to remove the offensive odors and particulate matter in the off-gases are wet scrubbers and incinerators. Evaporation can be used to concentrate liquids containing small amounts of contaminants to much smaller volumes and to concentrations that permit incineration. The lime kiln and recovery boiler of the typical Kraft mill are commonly used to burn the odorous gases, thus achieving odor destruction. (Author abstract modified)

35606 **APTIC NO. 58708**

Alanova, T. G., L. M. Robinovich, T. Ya. Mikyeyeva, and L. P. Martysheva

CATALYTIC PURIFIFICATION OF WASTE GASES FROM SYNTHETIC FATTY ACID MANUFACTURING PROCESSES. *(Kataliticheskaya ochistka otkhodyashchikh gazov proizvodstva sinteticheskikh zhrinykh kislot). Text in Russian. Khim. Prom. (Moscow), 49(3):233-234, 1973. 5 refs.*

Pilot experiments with a new M-2 type catalyst for the catalytic purification of waste gases from synthetic fatty acid manufacturing proceses, containing aldehydes, alcohols, and acids, are described. The catalyst is composed of a mixture of common metal oxides with a few thousandth parts of platinum on a nonporous metallic support. The catalyst excells by its specific surface, low hydraulic resistance, good heat conduction, and high oxidizing activity for organic substances. The waste gases to be purified were preheated to the necessary temperature for the catalytic oxidation. At a catalysis temperature of 370 C, the rates of conversion of alcohols, acids, and aldehydes reached 95-100%, 90-98%, and practically 100%.

35607 **APTIC NO. 58956**

Alexander, Frank A., Jr.

GAS TREATING APPARATUS. *(Morgan Construction Co., Worcester, Mass.) U. S. Pat. 3,764,259. 5p., Oct. 9, 1973. 1 ref. (Appl. June 16, 1972, 6 claims).*

An apparatus, for use with a regenerative furnace is described. It heats an incoming flow of combustion air while simultaneously cooling the waste gases being discharged from the furnace prior to directing the gases to a gas cleaning device. The apparatus includes a regenerative heat exchanger (regenerator) connected in series with a recuperative heat exchanger (recuperator) between the furnace and the gas cleaning device. Incoming combustion air is directed initially through the recuperator and then through one of the chambers of the regenerator before being admitted to the furnace. Waste gases are passed through the other chamber of the regenerator and then through the recuperator before being directed to the gas cleaning device. The apparatus further includes a valve mechanism for simultaneously reversing the flow of waste gases and combustion air through the chambers of the regenerator. (Author abstract)

35608 **APTIC NO. 59107**

Alliger, Howard

AIR POLLUTION ABATEMENT APPARATUS. *(Assignee not given.) U. S. Pat. 3,763,634. 4p., Oct. 9, 1973. 11 refs. (Appl. June 24, 1968, 2 claims).*

This invention features the use of sprays which are directed across the path of dirty air or gases and which are arranged at right angles to each other. A mist made up of very fine particles is used so that the dirty air or gases including soot flow initially into a moving mist and do not bounce off. A second moving mist is arranged normal to the path of the first moving mist. An application of ultrasonic energy causes the soot and noxious material to combine with the mist since the ultrasonic vibrations breaks down the surface tension of the liquid droplets and permits the furious combination of the noxious material and soot with the droplets. These droplets pass into engagement with the second moving mist for particle agglomeration and thence through a novel de-mister for separation of the mist and particles from the cleaned air and gases. This apparatus eliminates the need of a large chimney, uses no moving parts, uses no chemical additions, and eliminates the need for sealing the system. It will work with a large range of combustion velocity and volumes.

35609 **APTIC NO. 59346**

Alliger, Howard

AUTO EXHAUST SCRUBBER WITH CATALYST. *(Assignee not given.) U. S. Pat. 3,768,981. 4p., Oct. 30, 1973. 9 refs. (Appl. Feb. 16, 1971, 3 claims).*

An automobile exhaust scrubber/catalyst combination has been developed for reducing the concentrations of noxious components such as lead particles, hydrocarbons, nitrogen, sulfur, and carbon monoxide which commonly are emitted from internal combustion engines. The invention overcomes prior art disadvantages relating to reduction of vehicle efficiency and shortness of scrubber efficiency period by providing an arrangement wherein a pump operating proportionately to the speed of the engine pumps scrubbing liquid from a tank to a filter so as to enable the scrubbing liquid to mingle and be mixed with the gas to be cleaned. The device features the employment of a catalyst which functions as the scrubbing liquid and passes with the gas to be cleaned through the mesh of the filter so as to closely contact and effectively chemically change and entrap the noxious material. The catalyst used may be platinum, alumina, vanadium pentoxide, or manganese dioxide for oxidizing hydrocarbons, nitric oxide to nitrogen dioxide, or carbon monoxide to carbon dioxide. The scrubbing liquid may be an oil or an oil and water emulsion or some other high temperature fluid such as tetraethylene glycol or brake fluid.

35610 **APTIC NO. 58345**

Amann, C. A.

AN INTRODUCTION TO THE VEHICLE GAS TURBINE ENGINE. *In: Engineering Know-How in Engine Design - Part 21. Preprint, Society of Automotive Engineers, Inc., New York, p. 9-21, March 1973. 32 refs. (Presented at the Society of Automotive Engineers, Paper 730618.)*

The vehicle gas turbine engine is discussed as an alternate to the internal combustion engine. The developmental history of the engine for automotive use is traced, and the characteristics of the engine components, their function in the complete powerplant, and recent activities in the gas turbine field are discussed. The exhaust pollutants of interest in the automotive turbine are unburned hydrocarbons, carbon monoxide, and nitrogen oxides. Current research centers on reducing NOx emissions. The techniques employed directly to the combustor can be classed into three groups: control of residence time, leaning the primary zone, and staged combustion. These techniques attack NOx production in the burner itself. Other approaches have been suggested which might be classed as modifications of the engine cycle. The injection of either steam or water into the burner has proved effective in NOx reduction. Other areas being investigated include new combustion concepts, cycle modifications, the single shaft engine, and the use of ceramics. (Author abstract modified)

35611 **APTIC NO. 58935**

Barnard, John C.

COOLING SYSTEMS FOR INTERNAL COMBUSTION ENGINES. *(Assignee not given.) U. S. Pat. 3,765,384. 7p., Oct. 16, 1973, 8 refs. (Appl. Dec. 3, 1971, 20 claims).*

A cooling system which comprises one or more cooling jackets in close proximity to the cylinder heads of an internal combustion engine is described. Each jacket surrounds a spark plug associated with a cylinder. Each of the jackets is connected to a heat exchanger, such as a radiator, by coolant delivery and return lines. A metal composition which is in a solid state at non-operating temperatures of the engine is liquefied by the heat of the engine when operating and serves as the coolant. During operation it is continually circulated through the jackets surrounding each of the spark plugs to cool the engine. By virtue of cooling the immediate areas of the engine in proximity to the spark plugs, the heat of combustion can be rapidly dissipated which allows the engine to be operated at optimum temperatures. The operating efficiency is increased without the problems incident to the presence of localized excess temperature conditions normally produced at the cylinder heads. As a result of higher operating efficiency, the exhaust gases from engines equipped with the present cooling system contain a relatively low amount of the pollutants normally produced by internal combustion engines. Hydrocarbons, particulates, carbon monoxide, and nitrogen oxides are either oxidized or reduced more efficiently and the engine exhausts contain less pollutants.

35612 **APTIC NO. 58959**

Baum, Edward J.

APPARATUS FOR REMOVING POLLUTANTS FOR STACK EFFLUENTS. *(Assignee not given.) U. S. Pat. 3,776,971. 8p., Oct. 23, 1973. 2 refs. (Appl. May 13, 1971, 17 claims).*

A series of controlled gradient condensers for removing gaseous hydrocarbon pollutants from the stack effluent of industrial treating plants is described. The gaseous effluent stream is conducted from the plant to a pre-cooler to bring the effluent temperature to the condensation point of the highest boiling pollutant. Thereafter the effluent stream is passed through a successive series of controlled gradient condensers, each operating at a temperature range lower than that of the immediately preceding condenser. Each condenser has a reservoir which collects the condensed pollutants by gravity feed, while the uncondensed remaining effluent passes to the next succeeding condenser. The different temperature ranges at which the respective condensers operate are preferably fixed so that the minimum temperature at the outlet of a respective condenser is greater than the highest melting point of any pollutant condensed within that condenser, so as to prevent solidification of the pollutants and fouling of the condensers. The systems for maintaining the appropriate temperature range at each condenser are described. (Author abstract modified)

35613 **APTIC NO. 59020**

Baum, H. E.

TESTING A PROCEDURE OF CONTROLLING ODOROROUS EMISSIONS FROM WASTE WATER TREATMENT PLANTS IN GREAT BRITAIN. *(Essais, en Grande-Bretagne, d un procede de lutte contre les odeurs emanant des stations d epuration). Text in French. Tech. Sci. Munic, Rev. Eau, 68(10):427-430, Oct. 1973.*

A new, simple method of malodorous emission control from waste water treatment plants, now being studied in Great Britain, is described. Malodorous emissions from open water surfaces in waste water treatment plants are controlled efficiently by covering the water surface with Allplas type polypropylene balls floating on the water. The balls are available in diameters of 20, 45, and 150 mm, and are ribbed to prevent rotation. Regardless of the ball diameter, the balls cover 91% of the total water surface. Experiments with hydrogen sulfide containing waste waters showed that a single layer of balls on the water surface is able to abate H2S emissions by 98.2%, while a double layer and triple layer have efficiencies of 98.65% and 98.8%, respectively.

35614 **APTIC NO. 58900**

Becker, Kenneth W.

REMOVAL OF PARTICULATE MATTER FROM AIR BY VARIOUS POLLUTION ABATEMENT SYSTEMS. *J. Am. Oil Chemists Soc., 50(12):504-506, Dec. 1973. 4 refs. (Presented at the Tall Oil Symposium, AOCS Meeting, New Orleans, La., May 1973.)*

The removal of particulate matter from industrially-contaminated air and design criteria for air vent systems are reviewed along with the presentation of several pollution control case histories. Removal of 99% or better of small particulate matter from stack gases usually requires the employment of absolute or industrial filters, venturi scrubbers, or deep bed gas absorbers. Electrostatic precipitators, direct or catalytic incinerators, and various types of gas absorbers can be operated at medium face velocities to achieve up to 95% removal of particulate matter; and the dry intertial cyclone can be operated at relatively high face velocities, though its efficiency is usually lower than that of other devices. High and ultra high efficiency dry inertial cyclones, however, have been employed at efficiencies higher than 95%.

35615 **APTIC NO. 58988**

Belt, Verland W.

PARTICLE COLLECTOR FOR CLEANING GASES. *(Josam Developments, Inc., Michigan City, Ind.) U. S. Pat. 3,766,717. 7p., Oct. 23, 1973. 3 refs. (Appl. June 12, 1972, 10 claims).*

A relatively simple and inexpensive gas scrubber is described. A conically-sump-bottomed, vertical, cylindrical vessel is horizontally partitioned by a header plate loosely pendently supporting an array of tubes into an upper gas inlet chamber with a radial gas inlet and, above a sump water level, a lower gas flow chamber wherein a mist abating perforated end of a vertical cylindrical outlet duct is eccentrically located remotely from the inlet. The array of tubes with upper ends projecting loosely through and slightly above the plate directs gas from the inlet chamber against the water surface in the sump. Water, nozzle-sprayed into the incoming gas, both wets the tube inner surface and collects on the plate to seep between the plate and tube ends, duct, and vessel wall to wet the outer tube surfaces, duct, and wall, and carries material, picked up by spray droplets and by the wide area films on the tubes, duct, and wall, down into the sump for bottom withdrawal. Particles and droplets are further captured by the gas flow impinging on the sump water surface, and in flowing turbulently up from the water surface and around the externally wetted tubes and through the perforated outlet. (Author abstract modified).

35616 **APTIC NO. 58310**

Bennett, H. A. and A. Meisen

HYDROGEN SULPHIDE-AIR EQUILIBRIA UNDER CLAUS FURNACE CONDITIONS. *Can. J. Chem. Eng., 51(6):720-724, Dec. 1973. 19 refs.*

Equilibrium compositions of mixtures resulting from reactions between hydrogen sulfide and air at atmospheric pressure were calculated for temperatures and oxygen/H2S ratios ranging from 600 to 2000 K and 0.05 to 1.0, respectively. Forty-four compounds containing nitrogen, hydrogen, oxygen, and sulfur were assumed to be formed but only 25 had concentrations exceeding 0.1 ppm. These compounds should not, as in previous studies, be omitted from equilibrium calculations. Sulfur yields are increased by approximately 10% if O2/H2S ratios less than stoichiometric are used. Reasons for this and implications for Claus plant operation are given. (Author abstract)

35617 **APTIC NO. 58382**

Bhatia, S. P., T. L. C. de Souza, and S. Prahacs

REMOVAL OF SULFUR COMPOUNDS FROM KRAFT RECOVERY STACK GASES WITH ALKALINE SUSPENSIONS OF ACTIVATED CARBON. TAPPI, 56(12):164-169, Dec. 1973. 7 refs. (Presented at the Technical Association of the Pulp and Paper Industry, Environmental Conference, San Francisco, Calif., May 14-16, 1973.)

The removal of sulfur compounds from kraft recovery stack gases with alkaline suspensions of activated carbon was investigated. Total reduced S removal efficiencies of up to 99% could be achieved when using catalytic concentrations of activated carbon. Pilot scale testing of a process based on the use of alkaline suspensions of activated carbon is currently in progress. A preliminary cost estimate for scrubbing the recovery furnace flue gases in an existing 500 ton/day kraft mill shows a capital cost of $680,000. The total treatment cost was estimated at $1.26/air-dried ton of pulp. There would be an added cost of about $0.50/ton of pulp in all cases where the stack gas may have to be reheated to maintain an adequate plume height. (Author abstract modified)

35618 **APTIC NO. 58895**

Billon, A. and S. Franckowiak

DESULFURIZATION OF FUEL OILS AND FLUE GASES. *(La desulfuration des combustibles petroliers et des fumees de combustion). Text in French. Rev. Gen. Thermique (Paris), 12(142):931-935, Oct. 1973.*

Prospective and actual methods for the desulfurization of fuel oils and of flue gases are described. Hydrogenation is regarded as the commonest process for the desulfurization of fuel oil in refineries, and possibly in large-capacity thermal power plants. The desulfurization of heavy oils by hydrogenation poses serious problems compared with that of the light oils. Indirect desulfurization by vacuum distillation and asphalt removal from the residue under vacuum, and finally desulfurization of the distillate, are proposed. Flue gas desulfurization, originally done by means of calcium salts, is now more and more oriented to the production of saleable products, such as elemental sulfur or sulfuric acid. In a new process, the flue gases are scrubbed with an ammoniacal solution, while in a second stage of the process, ammonia is regenerated, and elemental sulfur of commercial quality is obtained. The gasification of fuels for desulfurization and the use of gas turbines in a high-efficiency combined cycle belong to the long-term possibilities of fuel desulfurization.

35619 **APTIC NO. 58693**

Blakeslee, C. E. and A. P. Selker

PROGRAM FOR REDUCTION OF NOX FROM TANGENTIAL COAL-FIRED BOILERS PHASE I. *Combustion Engineering, Inc., Windsor, Conn., Environmental Protection Agency Contract 68-02-0264, Program Element 1A2014, EPA-650/2-73-005, 195p., Aug. 1973.*

NTIS: PB 226547/AS

A pilot field test program is being developed to evaluate combustion modification techniques to reduce nitrogen oxides emission from tangentially coal-fired steam generating units. Details of the preliminary test program are presented including analytical measurement and sampling techniques, engineering drawings, cost estimates, and schedules. Overfire air is the least expensive technique for controlling NOx, incurring no loss in unit efficiency or increased operating expenses. Flue gas recirculation is significantly more costly, requires additional fan power, and could result in a 10-20% decrease in load capability due to increased gas flow weights. Water injection into the fuel firing zone has the lowest initial equipment cost, however, losses in unit efficiency make it the most expensive system to operate. The cost of applying controls to existing units generally is twice that of new units. (Author abstract modified)

35620 **APTIC NO. 58731**

Boone, J. E. and J. H. Turner

PROPERTIES OF AMMONIUM SULFATE, AMMONIUM BISULFATE, AND SULFUR DIOXIDE SOLUTIONS IN AMMONIA SCRUBBING PROCESSES. (FINAL REPORT). *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., ROAP 21ACX, Task 62, Program Element 1A2013, EPA-650/2-73-012, 44p., Aug. 1973. 5 refs.*

NTIS: PB 223000

The properties of ammonium sulfate, ammonium bisulfate, and sulfur dioxide solutions in ammonia scrubbing processes were determined. The collected data are useful in evaluating pilot plant operation of an ammonia scrubber with an ammonium bisulfate regeneration system. The data include: the density, pH, and composition of saturated (NH4)2SO4 solutions at 50, 65, and 80 C; the effects on density, pH, and composition of NH4HSO4 addition to the (NH4)2SO4 solutions at various temperatures; and the solubility and the stripping rates of SO2 in saturated solutions of (NH4)2SO4 containing ammonium bisulfate at 65C and 80C. The solubility of (NH4)SO4 in water was determined, and good agreement was found with accepted values. The addition of NH4SO4 to the saturated solutions lowered the solubility of (NH)2SO4, decreased the pH, and increased the density. The solubility of SO2 in saturated (NH)2SO4 decreased with increasing temperature and with increasing concentration of NH4HSO4. The SO2 stripping rate is dependent on temperature, NH4HSO4 concentration, and almost certainly on sweep gas rate and agitation rate. (Author abstract modified)

35621 **APTIC NO. 58701**

Brisson, B., A. Ecomard, and P. Eyzat

A NEW DIESEL COMBUSTION CHAMBER--THE VARIABLE-THROAT CHAMBER. *Preprint, Society of Automotive Engineers, New York, 11p., 1973. 8 refs. (Presented at the Society of Automotive Engineers International Engineering Congress, Detroit, Mich., Jan. 8-12, 1973.*

A variable-throat combustion chamber was developed. Design details are discussed, along with combustion speed, heat transfer coefficient, reliability testing, and emissions. The chamber is intended primarily for railroad use. Compared to a standard precup, the chamber gains in both overall efficiency and maximum pressure. Compared to a direct-injection engine, a 30% decrease in maximum pressure with the same efficiency is evident. The chamber emits less smokes, hydrocarbons, and nitrogen oxides than conventional combustion chambers. A program is underway to improve the natural low pollution tendency of the chamber for truck engines. (Author conclusions modified)

35622 **APTIC NO. 58562**

Bruley, A. J., W. G. Cook, and R. A. Ross

THE PYROLYSIS OF EXTRACTED SOLIDS FROM OXIDIZED KRAFT BLACK LIQUOR AFTER LIGNIN PRECIPITATION. *Can. J. Chem. Eng., 51(6):746-750, Dec. 1973. 7 refs.*

A laboratory investigation was made of the possibilities for the reduction of odor from Kraft mill stack gases by lignin precipitation from oxidized Kraft black liquor and subsequent pyrolysis of the filtrate solids. Samples of oxidized black liquor were acidified with sulfuric acid and the lignin precipitate extracted. More than 90% w/w of the sodium in the original black liquor samples are retained in the filtrate after lignin removal at final pH 2.0. The evaporated filtrate solids containing the bulk of the black liquor inorganic chemicals were pyrolyzed and the evolved hydrogen sulfide, methyl mercaptan, and dimethyl sulfide monitored by gas chromatography. Gas chromatograph traces displaying the change with temperature of methyl mercaptan evolution during pyrolysis of the filtrate solids are shown. A thermogravimetric technique was used to investigate the decomposition rates of the extracted samples and these rates correlated with the levels of sulfur gases evolved during pyrolysis. Heats of combustion were determined by bomb calorimetry. Sulfur losses from the filtrate solids and the Kraft black liquor total solids are compared. There is a significant decrease in the evolution of organic sulfur gases from samples of ligin-extracted black liquor solids in comparison with the original total solids sample. An increase in the level of H2S evolution however, presents a problem. (Author abstract)

35623 **APTIC NO. 59163**

Cavallaro, J. A. and O. J. Van Eck

PREPARATION CHARACTERISTICS AND DESULFURIZATION POTENTIAL OF IOWA COALS. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Energy Research Center and Iowa Geological Survey, Iowa City, Iowa, Bureau of Mines RI 7830, 36p., 1973. 21 refs.*

Preparation characteristics of 10 coal samples collected from the significant coal-producing mines of Lucas, Mahaska, Marion, Monroe, and Wapello Counties in Iowa are described with special emphasis on physical desulfurization. All 10 samples were of high sulfur content as received, ranging from 4.2 to 10.4%; the organic sulfur content ranged from 0.8 to 3.8%. Pyritic sulfur content of the samples capable of appreciable reduction by crushing and washing, resulting in pyritic sulfur reductions ranging from 36 to 75%. Crushing to 3/8 in top size and removing the sink 1.60 specific gravity material provided float coal products containing 3.5 to 6.0% sulfur. These coals could be burned at utility plants utilizing sulfur dioxide removal processes with efficiencies ranging from 70 to 88% and still be in compliance with the current Federal SO2 emission regulations for stationary sources. (Author abstract modified)

35624 **APTIC NO. 59341**

Courbon, Paul

APPARATUS FOR THE SUCTION AND PURIFICATION OF POLLUTED AIR. *(Charbonnages De France, Paris (France)) U. S. Pat. 3,765,155. 9p., Oct. 16, 1973. 19 refs. (Appl. April 6, 1970, 15 claims).*

A radial fan apparatus for the suction and purification of particulate-laden air has been developed to act either as an air purifier or as a dust sampler which eliminates the need for preliminary size sorting associated with prior devices of its kind. A thick filter is held in a cup with a cylindrical edge and rotates about a vertical axis, having its opening directed downwards; while a cyclone separator with at least one tangential inlet is fixed in an air-tight and removable manner under the lower wall of the sampling chamber with its transfer tube directed upwards so as to form the suction orifice of the sampling chamber. Peripheral evacuation orifices are disposed tangentially with respect to the cylindrical wall of the sampling chamber and in the direction of rotation of the thick rotor. The sections of the suction orifice, the evacuation orifices, and the sampling chamber have values such that the suction flow is less than the actual flow rate of the radial fan.

35625 **APTIC NO. 59279**

Cueto, Jose Maluquer

AIR POLLUTION GENERATED BY MOTOR VEHICLES AND ITS ABATEMTNT. *(La contaminacion atmosferica por los vehiculos y su correccion). Text in Spanish. Ion (Madrid), 33(389):388-392, Dec. 1973. 7 refs.*

General problems of motor vehicle-generated exhaust emissions, and of catalytic exhaust control devices are discussed. In Europe, the exhaust carbon monoxide emission is limited to 4.5% for new vehicles, and to 5.5% for used ones with spark ignition engines. The limits proposed for the hydrocarbon, CO, and nitrogen oxides emissions in the USA by 1975 are 50 ppm, 0.5%, and 250 ppm. The production of CO and HC is conditioned by the quality of carburetion, turbulence, injection, ignition, and compression. The composition of the gasoline has little influence on the HC emissions. The NOx emissions can be effectively reduced by exhaust gas recirculation. Reduction of NOx and oxidation of CO and HC is possible by means of catalytic exhaust control devices at temperatures of 300-400 C. However, the life of such catalysts is sharply reduced proportional to the lead content of the gasoline. The catalyst can be protected by the use of lead bromide which, being volatile, decomposes before reaching the exhaust control device.

35626 **APTIC NO. 58539**

Dartnell, P. L.

EXHAUST EMISSION CONTROL, EFFICIENT ENERGY UTILIZATION, ARE THEY COMPATIBLE? *J. Automotive Eng., 4(6):10-16, Dec. 1973. 38 refs.*

In terms of emission control of the spark-ignition engine, certainly with respect to unburned hydrocarbons and carbon monoxide, a great deal can be accomplished by detailed design changes to the combustion chamber, intake manifold and carburetor. Examination of the efficiency of various alternative forms of power unit indicate that certain types, such as the steam engine, Stirling engine, free-piston engine, Rankine engine, and electric vehicle, have inherently low levels of emissions. However, none is exceptionally efficient and they must be considered impractical. On the basis, therefore, that moderate control of emissions will ensure acceptable standards of air quality, the reciprocating spark-ignition engine is compatible with effective use of energy resources, providing it can be fueled with gasoline of an adequate octane number. In order to produce such gasoline with minimum throughput of crude oil, it is essential to add an anti-knock agent in the form of a lead alkyl. Despite widespread activity, no evidence has been established that lead derived from gasoline-powered vehicles constitutes a health hazard. There are many options open for changing the relationships of octane number and the level of lead addition to gasoline. All result, to a greater or lesser degree, in increased usage of crude oil and increased application of resources and investment to the refinery industry. The quest for cleaner engines could well be linked to improved thermal efficiency of the spark-ignition engine. For example, if lean operation can be achieved without sacrifice to drivability, gaseous emissions will be at a minimum.

35627 **APTIC NO. 58943**

Doi, Kunihiro, Kenkoku Azuma, and Kyoko Nishiyama

DEODORIZATION OF SULFUR COMPOUND BY OZONE. *(Kurafuto parupu kojo haigasu no ozon dasshu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):376, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 116.)*

The deodorization effects of ozone on various sulfides at Kraft Pulp mills were experimented in a lab and on site. For static experiments, reaction chambers filled with a given concentration of ozone mixed with odor gas, and the time change and formation substances were examined. With a lab flow system, a given concentration of hydrogen sulfide and O3 were mixed, and after 5 sec the mixture was passed through an activated carbon layer, and the oxidation degradation effect was checked. In a field test, exhaust from the fraction pulp scrubbing process was drawn by a blower and the reaction with O3 was checked in a duct hose. The gas was then sent to a scrubber and an activated carbon tank. Good results were obtained with O3 only with dimethyl sulfide and methyl mercaptan, both of which can be deodorized by less than the theoretical amount of O3. But in the low concentration area, the reaction speed is slow. In flame photometric detector field tests, the peaks disappeared in the order of dimethyl sulfide, methyl mercaptan, and dimethyl disulfide. With hydrogen sulfide, an oxidation accelerator is necessary. The combined use of O3 and activated carbon is good, and if the activity is not damaged by reaction substances, this would be a workable deodorization method. Catalytic metal oxidation creates a secondary pollution.

35628 **APTIC NO. 59082**

Dolbear, Geoffrey E.

SYSTEM FOR REMOVING NITROGEN OXIDE FROM AUTOMOTIVE EXHAUST. *(Grade (W. R.) and Co., New York) U. S. Pat. 3,767,764. 3p., Oct. 23, 1973. 6 refs. (Appl. Dec. 9, 1971, 5 claims).*

A process for removing carbon monoxide, hydrocarbons, and nitrogen oxides from the exhaust stream of internal combustion engines is described. It passes the exhaust through a catalyst for conversion of the CO to carbon dioxide and the NOx to ammonia, followed by admixing the effluent from the catalyst with a second exhaust gas stream diluted with air, and passes this combined effluent through a second catalytic convertor, wherein the ammonia and NOx react to form nitrogen, and the CO and HC are converted to innocuous entities. This system is an improvement over previous catalytic systems which required the addition of ammonia to the gas stream, since it provides its own ammonia. Although the novel system is particularly applicable to V8 automotive engines, satisfactory results are also obtained with four and six cylinder engines with slight modifications of the system. (Author abstract modified)

35629 **APTIC NO. 59137**

Dorman, R. G., D. B. Purchas, M. Block, A. Little, W. T. Cosby, P. Eisenklam, and W. B. Lawrie

SOLID-GAS SEPARATION: EQUIPMENT. *In: I. Chem. E. Filtration Working Party Report, 1973. p. 20-30, Nov. 1973. 15 refs.*

Mechanisms of filtration, theories of filtration, and filter efficiency are discussed for fibrous filters, bag filters, air conditioning filters, and high efficiency filters. Impaction is a process in which a particle contacts an obstacle to which it adheres and is removed from the gas steam. It is the major mechanism of collection in dry impingement separators, sieve-type filters, scrubbers, and fibrous filters. Mechanisms of collection include impaction, electrostatic forces, and diffusion. Inertial collectors include settling chambers and cyclones. Deficiencies in gas cyclones and small diameter nested cyclones are discussed. Design features are discussed including base pick-up in single cyclones, smooth cyclone walls, structures across the vortex core, inlet-exit effects, cyclone base features, and purging gas from cyclones. Electrostatic precipitators are used in air cleaning and for cleaning industrial fumes and dusts. Particulates can also be separated from gas streams by coagulation by sonic vibrations and by collection in a fluidized bed. The movement of airborne dust and the design of exhaust hoods are discussed. Dust dispersion is affected by kinetic energy, air movement, mechanical causes, entrainment, induction, displacement, convection, pressure, and temperature. Exhaust hoods include total enclosures, booths, and remote hoods (including captor hoods and receptor hoods).

35630 **APTIC NO. 58461**

Emi, Hitoshi, Kikuo Okuyama, and Naoya Yoshioka

PREDICTION OF COLLECTION EFFICIENCY OF AEROSOLS BY HIGH-POROSITY FIBROUS FILTER. *J. Chem. Eng. Jap., 6(4):349-354, Aug. 1973. 18 refs. (Presented at the Society of Chemical Engineers, Annual Meeting, 37th, Nagoya, Japan, April 3, 1972.)*

In the filtration of aerosols by a high-porosity fiber mat, the deposition of particles smaller than a few micron in diameter on a fiber depends on the combined effect of inertial impaction, Brownian diffusion, gravitational settling, and direct interception, in the case where neither particles nor filters are electrically charged. The results of research on the collection efficiency of an isolated fiber due to the above four mechanisms are presented. The dependences of the efficiency on the linear gas velocity and diameters of particle and fiber are discussed. In addition, a convenient method is proposed to predict the practical collection efficiency under arbitrary operating conditions. Prediction charts obtained in this manner can be made for the design of fibrous filters with porosity of more than 0.98. (Author abstract)

35631 **APTIC NO. 58517**

Finneran, J. A., J. R. Murphy, and E. L. Whittington

THE HEAVY OIL CRACKING PROCESS FOR CLEAN FUEL PRODUCTION. *Chem. Economy Eng. Rev., 5(12):18-21, 1973.*

The Heavy Oil Cracking (HOC) Process is described. It is a new and economical method for catalytic conversion of reduced crude to naphtha and other distillates. It is a special version of the familiar Fluid Catalytic Cracking (FCC) Process. Some applications of the HOC Process include: producing high amounts of high octane gasoline and C3-C4 olefins for alkylation in gasoline-oriented refineries; a low conversion adaptation of HOC to maximize distillates for subsequent desulfurization -- this would permit replacement of the costly residual desulfurization unit with a distillate desulfurization unit, and would lower the attainable sulfur content of fuel oil; conversion of heavy crude to marketable synthetic crude or to cat-cracker feedstock; and conversion of a major portion of atmospheric resid to synthetic naphtha for subsequent conversion to petrochemicals or to clean fuels such as synthetic natural gas (SNG). Several commercial HOC plants are described. Operation of the HOC converter, catalyst activity and use, and use of the HOC reactor to remove sulfur compounds from the stack gas are described.

35632 **APTIC NO. 58665**

Fleming, R. D. and J. R. Allsup

NATURAL GAS AS AN AUTOMOTIVE FUEL, AN EXPERIMENTAL STUDY. *Bartlesville Energy Research Center, Bartlesville, Okla., Bureau of Mines Rept. 7806, 30p., 1973. 12 refs.*

Natural gas was studied to evaluate its use as an automotive fuel and to provide guidelines for optimum engine adjustments for low exhaust emissions. A single-cylinder engine, a multicylinder engine, and a total of eight vehicles were used in the study. In single-cylinder engine tests the light-load, lean-limit, misfire region for natural gas begins at an air-fuel ratio between 150 and 160% of stoichiometric. Changes in ignition timing significantly influenced emissions of nitrogen oxides and hydrocarbons, but had little effect on carbon monoxide emission. Low emissions can be achieved with current-design engines by adjustment of engine parameters, but only with heavy penalty to engine performance. Emissions from vehicles fueled with natural gas are virtually unaffected by ambient temperature change within the range 20 to 100 F. The organic emissions from engines fueled with natural gas were estimated to be 22 to 25% as reactive as the emissions produced using gasoline. Levels of exhaust emissions from vehicles fueled with natural gas were unchanged over 10,000 mi of normal driving. (Author abstract)

35633 **APTIC NO. 58309**

Foppiano, Mario

REMOVAL OF PARTICULATE MATTER FROM GASEOUS WASTES FROM OXYGEN BLOWN ELECTRIC ARC FURNACES FOR STEEL PRODUCTION. *(La depolverazione dei gas prodotti dai forni elettrici ad arco con soffiaggio di ossigeno per la produzione di acciaio). Text in Italian. Termotecnica (Milan), 27(10):579-593, Oct. 1973. 7 refs.*

The problem is first considered with regard to the new Italian law 615. Two dust samples are analyzed chemically and dust concentrations and grain size distribution are examined. The quantities of gas which must be sucked, together with outside air, from different-sized furnaces are considered. A number of dust collecting systems are discussed; dry collection by textile filters; wet collection by high energy scrubbers; wet collection by condensing scrubbers; dry collection by dry electric precipitators; and wet collection by wet electric precipitators. The problems involved with conducting the furnace exhaust through water cooling ducts and those arising from the necessity of cooling the gases ahead of the collector are considered. Installation and operating costs are presented. Technical data for the design of dust collectors of the new high power furnaces are given.

35634 **APTIC NO. 59303**

Foss, E.

THE SO2-SCRUBBER AT THE GRYCKSBO PAPER MILL. *European Liaison Committee for Cellulose and Paper, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 657-665, 691-697. 2 refs. (May 7-11.)*

The operation and efficiency of the sulfur dioxide scrubber at the Grycksbo (Sweden) Paper Mill are described. The scrubber system which was based on limestone is designed for a flue gas flow of 30,000 N cu m/hr at a temperature of 145 C. Dust collection efficiency was 99%, but SO2 efficiency was only 63%. In order to increase the scrubbing efficiency, a series of test runs were carried out with hydrated lime which has a better solubility than limestone. The SO2 cleaning efficiency was raised to 80-90%, but the cost of hydrated lime per ton of pulp is about 4 2/3% higher than limestone. For economical reasons it was not considered possible to use hydrated lime.

35635 **APTIC NO. 59242**

Freyschuss, S.

TECHNICAL REPORT FROM THE STOCKHOLM UN CONFERENCE *European Liaison Committee for Cellulose and Paper, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 37-42, 109-112. (May 7-11.)*

The 1972 United Nations Conference in Stockholm on environmental problems is discussed. It adopted a Declaration on the Human Environment and 106 recommendations directed to governments and international organizations concerning international action against environmental pollution. It also adopted five resolutions, the most important of which was a proposal to the General Assembly concerning the institutional machinery of the UN for future handling of environmental questions. The most important guiding principle in the declaration is the responsibility of states to ensure that activities within their own countries do not create damage to the environment of other countries which lie outside national jurisdiction. The struggle of all countries against pollution should be supported and the discharge of toxic substances and the release of heat in harmful quantities be stopped.

35636 **APTIC NO. 59080**

Frye, Elroy E. and Harold L. Trentham

METHOD OF SEPARATING SULFUR DIOXIDE FROM GASEOUS MIXTURES. *(Trentham Corp., Houston, Tex.) U. S. Pat. 3,767,777. 4p., Oct. 23, 1973. 4 refs. (Appl. Feb. 23, 1972, 10 claims).*

Sulfur dioxide in flue gas can be removed by contacting the gaseous mixtures with an aqueous solution containing a water soluble trialkyl phosphate. The SO2 is absorbed by intimate, countercurrent contact with the phosphate solution. A concentrated stream of SO2 is obtained by regeneration of the absorbing solution, and this SO2 can be recovered. This invention can be used to absorb SO2 from tail gas from a Claus-type elemental sulfur recovery unit, from the gas stream from the regenerator of a conventional oil refinery catalytic cracking unit, and from flue gases resulting from fossil fuel combustion.

35637 **APTIC NO. 58519**

Fusamura, Nobuo, Takashi Iwasaki, and Hideaki Sekiguchi

ON THE EFFICIENCY OF FINE DUST ELIMINATION BY THE MODIFIED DUST COLLECTOR COMBINED WITH CONDENSATION SYSTEM. *(Gyoshu-shiki jojin sochi to sono jojin seino). Text in Japanese. Anzen Kogaku (J. Japan Soc. Safety Eng.), 12(6):395-400, Dec. 1973. 3 refs.*

Cyclone dust collectors are generally inefficient in eliminating small particles with diameters below 1 micron without a special procedure to make small particles into large particles by condensation or other processes. A modified dust collector combined with a condensation system is described. It is composed of a venturi type mixer which mixes hot steam at a low pressure of up to 0.5 kg/sq cm and at a comparatively low temperature to the extent of 100-110 C. It also contains a condenser including water tubes for cooling the dust-steam mixture, a washer to eliminate excessive condensed water and for recondensation, and an ordinary cyclone collector. Above 70% of the particles are eliminated from the soot flow by the new collection system; these are composed of 0.1 micron sized particles. Successively operated, the system is efficient for collection of rock dust or removal of dust after polishing residual dust.

35638 **APTIC NO. 58995**

Ginocchio, Roger

WAR ON SULFUROUS FUEL-GENERATED AIR POLLUTION. THE STANDPOINT OF ELECTRICITE DE FRANCE. *(La lutte contre la pollution atmospherique due aux combustibles sulfureux. Le point de vue d Electricite de France). Text in French. Ann. Mines (Paris), 1973:61-74, Nov.- Dec. 1973.*

General problems and possibilities for abating sulfur dioxide emissions from thermal power plants are discussed. The dilution of SO2 emissions is impeded by stable thermal stratification of the lower layers of the atmosphere, and by thermal inversion. Systematic measurements of the SO2 concentrations around the Porcheville power plant revealed fairly low average concentrations in the order of magnitude of 1 microgram/cu m, with a maximum of about 35 micrograms/cu m. The SO2 emission dispersion can be substantially improved by the use of high stacks. However, the desulfurization of the fuel oil or of the flue gases represents a more genuine solution. The SO2 present in flue gases can be oxidized by ozone to sulfur trioxide which is then absorbed by sulfuric acid. The Weiritam-Kuhlmann ammonia process envisages treatment of the flue gases with aqueous ammoniacal solution, after which the ammonium sulfite is treated with lime for the recovery of ammonia. Another process produces elemental sulfur by means of ammonia. Flue gases from coal-firing power plants are washed with slaked lime for the removal of about 70% or more of SO2. According to the Heurtey-Babcock process, the fuel is partly oxidized under atmospheric pressure in fluidized bed of calcium carbonate and magnesia particles at 800 C. The hydrogen sulfide is bound principally in the form of calcium sulfide. The Shell fuel gasification process operates under 15-25 bar pressure at 1400 C temperature, and is especially well suited for mixed steam turbine-gas turbine cycle.

35639 **APTIC NO. 58379**

Gokyo, Shunji, Kenkjiro Inoue, Osamu Ito, Hiroshi Saito, Nobuo Furuya, and Senichi Masuda

HYBRID ELECTROSTATIC PRECIPITATOR. *(Haiburid-dogata denki shujin sochi). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):355, 1973. (Presented at the Japan. Society for Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 99.)*

A cement kiln flue gas desulfurization and dust collecting hybrid electrostatic precipitator, was developed, and after a year of pilot plant operation, an actual system was constructed which has been successfully operating for more than seven months. The system contains a slurry treatment section, a dry electrostatic precipitator, and a wet electrostatic precipitator. In the slurry treatment section and wet electrostatic precipitator, sulfur oxides and other harmful gases are absorbed up to 90%. Most of dusts are collected in the dry electrostatic precipitator section, but submicron dusts are further collected in the wet electrostatic precipitator section, and at the exit, dust concentration is 0.01-0.04 g/N cu m. The slurry produced in the process is separated into a supernatent liquid, which is recirculated, and slurried by thickener; the slurry is dried or made into pellets. The wet electrostatic precipitator dust collector utilizes a new method for forming water film, with the flue gas considerably higher than dew point, so an afterburner is not necessary.

35640 **APTIC NO. 59169**

Goldsmith, Alexander

SMOKE ABATEMENT FROM FREE-BURNING LIQUID FUEL FIRES. *Inst. Environ. Sci., Ann. Tech., Meet., 19th, Proc., Anaheim, Calif., 1973, p. 63-70. 9 refs. (April 2-5.)*

A method for the elimination of black smoke produced by free-burning fires of liquid petroleum fuels used for training military personnel in fire fighting is described. The method consists of injecting an atomized water spray at the surface of the burning fuel. It preserves the realism of a natural fire, including the response to the common methods of fire extinguishment. Analyses of the combustion products of both natural and treated fires showed that the treatment reduced particulate emission by more than 95%. Gaseous pollutants, including carbon monoxide, the oxides of sulfur and nitrogen, and unburned hydrocarbons were reduced by more than 50%. (Author abstract modified)

35641 **APTIC NO. 58466**

Gopalachari, A. S.

RECOVERY OF FLUORINE FROM THE WASTE GASES OF PHOSPHATIC FERTILIZER PLANTS. *Chem. Age India, 22(10):677-683, Oct. 1973. 4 refs.*

When raw rock phosphate is treated for fertilizer production, fluorine escapes in the form of waste gases. Since this is normally the loss of a valuable by-product, particularly in the context of ever increasing demand for cryolite, aluminum fluoride, and a wide range of fluorine chemicals, a process was developed to recover the fluorine from the above source. The by-product recovery of fluorine also improves the environment by reducing fluorine pollution. The availability, consumption, and demand for fluoride compounds, the composition of commercial raw phosphates, the distribution of phosphate fertilizer plants in India according to rock phosphate consumption, the principal phosphatic fertilizer/phosphoric acid plants in India during 1972, the process for recovering fluorine from waste gases, and licensed and installed capacity for synthetic cryolite production and for sodium silico fluoride based on fluorine gases from phosphatic fertilizer plants are described.

35642 **APTIC NO. 58958**

Grisaffe, Salvatore J. and Ernest W. Klechke

NICKEL ALUMINIDE COATED LOW ALLOY STAINLESS STEEL. *(National Aeronautics and Space Administration, Washington, D. C.) U. S. Pat. 3,762,884. 3p., Oct. 2, 1973. 6 refs. (Appl. Oct. 18, 1971, 6 claims).*

Low alloy austenitic stainless steel is protected from oxidative corrosion and erosion at high temperature in the presence of exhaust gases from internal combustion engines by flame-spraying a layer between about 0.003 in. and about 0.007 in. thick of an alloy of 80% nickel and 20% chromium on the steel base, and thereafter converting the layer to an intermetallic Cr containing Ni aluminide coating by a low temperature aluminum cementation process. A cementation pack comprising 96% aluminum oxide, 2% Al, 1% sodium chloride, and 1% ammonium bifluoride is placed on the Ni-Cr layer in an inert atmosphere for a period between 4 hr and 24 hr at 1400 F to 1600 F to form an intermetallic Cr containing Ni aluminide coating containing 40 to 60 atomic % Al. The coated steel is highly resistant to oxidation corrosion and erosion by high temperature exhaust gases from internal combustion engines. It is particularly useful in the construction of thermal reactors for exhaust systems in automobiles for the control of pollution from exhausts. (Author abstract)

35643 **APTIC NO. 59348**

Groenendaal, Willem and Walter M. Lenz

COMBINED SULFUR OXIDES ACCEPTANCE-SULFUR RECOVERY PROCESS. *(Shell Oil Co., New York) U. S. Pat. 3,764,665. 7p., Oct. 9, 1973. 3 refs. (Appl. Feb. 7, 1972, 10 claims).*

An improved process in which sulfur oxides are accepted from gas mixtures on solid acceptors and are subsequently freed again by regeneration of these acceptors, with the regeneration off-gases being passed to a Claus sulfur recovery process, has been developed for the removal of sulfur oxides from flue gases. The invention s improvement comprises cooling the regeneration off-gas to condense the water vapor contained therein, contacting the cooled off-gas with a sulfur dioxide-selective liquid absorbent, and passing the fat liquid absorbent to a buffer zone and then to a stripping zone where the absorbed SO2 is recovered from the liquid absorbent and supplied to the sulfur recovery process. Preferred acceptors are metal and/or metal compounds applied to a suitable carrier which are capable of binding SO2 and/or sulfur trioxide as a sulfate for subsequent release as SO2 upon regeneration. The process ensures that fluctuations in the SO2 concentration of the regeneration off gas are leveled out and that a relatively concentrated SO2 stream is supplied to the sulfur recovery process at a substantially constant rate. (Author abstract modified)

35644 **APTIC NO. 59066**

Gustavsson, Karl-Axel Goran and Jan Karl Lennart Smitt

METHOD AND APPARATUS FOR CLEANSING FLUE GAS. *(Aktiebolaget Bahco, Stockholm (Sweden)) U. S. Pat. 3,767,765. 3p., Oct. 23, 1973. 5 refs. (Appl. Dec. 11, 1970, 1 claim).*

A method and apparatus for cleaning furnace flue gas are described. The flue gas is absorbed in an alkaline absorption liquid comprising water to which alkali is supplied at a controlled rate in response to the rate of fuel supply to the furnace. This method removes sulfur dioxide, soot, coke dust, ash, and other solid products of combustion. The invention is economical, since the cost of controlling the amount of alkali supplied to the system is small. The buffer effect of the carbonate formed by the carbon dioxide in the flue gas is so strong that the pH of the absorption solution remains practically constant at a predetermined level if alkali is charged in quantities proportionate with the amount of fuel consumed. (Author abstract modified)

35645 **APTIC NO. 59094**

Haines, John A.

INTERNATIONAL ASPECTS OF SULFUR OXIDES-GENERATED AIR POLLUTION. *(Aspects internationaux de la pollution par les oxydes de soufre). Text in French. Ann. Mines (Paris), 1973:123-133, Nov.-Dec. 1973.*

International aspects of sulfur dioxide-generated air pollution and policies and approaches adopted for the abatement of this air pollution in different industrialized countries are described. The differences in the policies concerning SO2 emission control in different countries are due to such in the geographic and economic conditions. While measures taken in different countries for SO2 emission abatement have resulted in noticeable local abatement of the SO2 concentrations in urban and industrial agglomerations, the overall SO2 concentrations have failed to abate due to the ever-increasing emissions. The use of low-sulfur fuels in place of high-sulfur ones, flue gas desulfurization, rational use of energy, increased boiler efficiency, improved heat insulation, and the use of new techniques for firing equipment and for emission control equipment are among the possibilities of abating SO2 emissions. The use of high stacks is regarded as a temporary solution to the problem in many countries. The sulfur content in fuel oils for domestic heating is limited to certain values in several countries. Full-scale flue gas desulfurization, as adopted in Japan, is already possible, and combinations of desulfurization and combustion in fluidized beds are being studied. Scandinavian experts are concerned about the transfer of SO2 pollution from Europe and Great Britain over Scandinavian territory, which finally results in losses in agricultural and forest production due to soil acidification.

35646 **APTIC NO. 58835**

Hario, S.

STUDIES ON ODOR REMOVAL OF HUMAN MANURE BY MEANS OF HEAVY METAL CATALYSTS. PART 2. *(Jukinzoku gosei shokubai o mochiita shinyo shuki joyko nikansuru kenkyu (2)). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 2(12):885-895, Dec. 1973. 45 refs.*

Odor removal experiments in the laboratory led to the building of a pilot plant low temperature catalytic combustion odor removal plant consisting of three catalytic layers. Sulfur compounds are adsorbed by ferric oxide and a low temperature adsorption catalyst composed mainly of zinc oxide. The gas is then catalytically oxidized by cuprous and chromic oxides to remove indols, amines, and fatty acids. The gas is blown at 1 N cu m/min at 250-300 C. The system had a removal efficiency of 99-100%. Examination of the catalytic layers after 3 mo showed S absorption levels of 0.54% for Fe2O3, 1.45% for ZnO, and 1.20% for Cu20-Cr2O3. The amounts were far below saturation values and therefore the catalysts had a longer life than was expected. A one-year trial at an organic waste treatment facility gave satisfactory results.

35647 **APTIC NO. 58626**

Heitner, Kenneth

STATUS REPORT ON CONTROL OF GASOLINE VAPOR LOSSES FROM STATION AND VEHICLE FILLING. *California Inst. of Tech., Pasadena, Calif., Environmental Quality Lab., National Science Foundation, Research Applied to National Needs Grant GI-29726, EQL Memorandum 5, 14p., May 1973. 16 refs.*

A status report on the control of gasoline vapor losses from station and vehicle filling for the reduction of air pollution in the South Coast Air Basin is presented. It is estimated that about 65 tons/day could be eliminated by controlling the gasoline vapors involved in gasoline marketing, as compared to a total of 210 tons/day of reactive hydrocarbon emissions from stationary sources projected for 1975. The losses involved in filling the station tank can be controlled by the use of a line that returns the displaced vapors to the truck or the use of a pressure-activated valve to close the vent during filling operation. A vapor return is the most practical way of controlling the losses. The key question in the control of vapors from vehicle tank filling is what to do with the vapors. Alternatives include trapping the vapors in the vehicle, returning the vapor to the station tank system, and incinerating or catalytically oxidizing the vapors. The best alternative is to use a vapor recovery system that puts a small suction on the fuel tank insuring that the vapors are drawn into the system and not expelled through the vents. The cost of these control systems will be considerably less than new vehicle controls already required by law and can be absorbed with a 2-3% increase in the price of gasoline.

35648 **APTIC NO. 59199**

Heitner, Kenneth and Randall G. Williams

ANALYSIS OF AN EVAPORATIVE CONTROLS RETROFIT PROGRAM FOR THE SOUTH COAST AIR BASIN. *California Inst. of Tech., Pasadena, Environmental Quality Lab., EQL Memo 3, 45p., April 1973. 3 refs.*

The retrofitting of evaporative control systems to pre-1970 model light duty vehicles is analyzed for the South Coast Air Basin back to 1962 to find which makes and models will continue to constitute a major fraction of the vehicle population over the next few years. Retrofitting is a viable option to speed up the rate of reduction of reactive hydrocarbon emissions. On the basis of the population analysis, a series of case studies was conducted which illustrate how the new vehicle control technology can be adopted to the retrofit situation. The cost of the materials and labor are estimated in detail, in order to obtain a realistic idea of typical retrofit costs. The possibility of a partial retrofit of controls covering either the carburetor or the fuel tank is also discussed. The legal status of the retrofit situation is reviewed. The cost of a retrofit program covering 65% of the eligible vehicles is estimated at about $200 million for the South Coast Air Basin. This is one time cost which could be spread over a 1-2 yr retrofit program.

35649 **APTIC NO. 58419**

Hirose, Yasuo and Teru Kannari

COUNTERMEASURE FOR CONTROL OF NOX EMISSIONS FROM NATURAL DRAFT BURNER. *(Jizen Tsufudaki bana ni tsuite no NOx yokusei taisaku). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan) (Tokyo), 52(558):791-797, Oct. 1973. 5 refs.*

A self recirculating gasification (SRG) burner was developed for control of nitrogen oxides emissions from natural draft burners. Both gas recirculation and two-stage combustion techniques were effectively applied by utilizing the rolling up phenomenon of high velocity fluid. Burner characteristics were evaluated with tests using various fuel oils such as C, B, and A class heavy oil and kerosene containing fuel nitrogen with 0.289, 0.180, 0.030 and almost negligible wt%, respectively. Results were compared with those obtained by a conventional natural draft Tandem-type burner at the identical operating conditons. When the SRG burner was operated with 30% excess air, there was a 37% NOx reduction on C heavy oil, 30% on B, 18% on A, and 15% on kerosene. Soot formation is also reduced with the SRG burner.

35650 **APTIC NO. 59112**

Hollnagel, Harold S.

AIR FUEL PREHEATER FOR INTERNAL COMBUSTION ENGINE. *(Assignee not given.) U. S. Pat. 3,762,385. 4p., Oct. 2, 1973. 12 refs. (Appl. March 29, 1971, 3 claims).*

A water-jacketed fuel vaporizing chamber is interposed between the carburetor and the intake manifold on an internal combustion engine. The flow path is tortuous and of considerable length which induces some turbulence and insures full vaporization of the gasoline. Carbon monoxide emission was reduced 73% on a test vehicle to a level below the 1975 Federal Standards. Unburned hydrocarbons and nitrogen oxides were respectively reduced 40.6% and 36% but not to the 1975 Federal Standards. The principal difference between the present arrangement and the prior art is that heat is applied at all times and the heated path is greatly increased as well as being made somewhat turbulent and both of these latter features run contary to normal intake manifold design which strives to shorten the path to the cylinder and to reduce turbulence to a minimum. With this arrangement there is sufficient residence time to insure complete vaporization, and, in fact, according to the prior art, too much vaporization. However, the performance is good, and, along with the reduction in emission, there is an increase in mileage of approximately 10%.

35651 **APTIC NO. 59110**

Ikebe, Kenji, Shigeru Tano, Kiyomi Sasaki, and Tatsuki Mayusumi

SEPARATING DEVICE FOR FINE PARTICLES, SUCH AS CARBONS AND THE LIKE. *(Tokyo Roki Kabushiki Kaisha, Kanagawa-ken (Japan)) U. S. Pat. 3,762,135. 6p., Oct. 2, 1973. 4 refs. (Appl. Aug. 31, 1971, 6 claims).*

The present invention provides a separating device wherein fine particles such as carbons entrained in an exhaust gas and charged with electricity are removed by feeding them through a magnetic field. The device consists of a housing provided with an inlet port adapted to intake the engine exhaust gas and an outlet port through which a cleaned exhaust gas is discharged. Within the housing, a magnetic unit having a plurality of magnetic elements is arranged in parallel in the axial direction of the housing with a space between each element to form magnetic fields in each space. The magnetic unit is also spaced from the inner surface of the housing. The space between the magnetic elements forms a part of a gas passage connecting the inlet port to the outlet port of the housing. The fine particles coming to this space are forced away from the space due to the magnetic force therein and clean exhaust gas is discharged to the outside of the housing through its outlet port. (Author abstract modified)

35652 **APTIC NO. 58966**

Ikeda, Minoru and Masatsume Sugimoto

DUST COLLECTIVE SYSTEM IN A COAL CHARGING OPERATION FOR COKE OVENS. *(Sumikin Coke Co., Ltd., Wakayamashi (Japan)) U. S. Pat. 3,767,536. 11p., Oct. 23, 1973. 6 refs. (Appl. Nov. 4, 1971, 5 claims).*

This invention is a dust-collecting system for gases containing dust produced by charging coke ovens with coal. A plurality of divided subducts are arranged on coke ovens and a main duct connected with them is connected with a dust-removing apparatus. A discharged gas, having passed through a dust-collecting and removing apparatus for gases containg dust as provided in a coal charging car, may be introduced into the duct and have the dust removed by the dust-removing apparatus connected with the main duct. The cleaned gas may then be discharged into the atmosphere. (Author abstract modified)

35653 **APTIC NO. 59289**

Ikegaya, Hiroshi and Teruo Arakawa

REMOVAL OF SOX, NOX GAS BY ACTIVE CARBON. *(Kasseitan ni yoru NOx, SOx no jokyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):434, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 168.)*

The efficiencies of 4 m/m diameter and 6 m/m diameter activated carbon particles for a stack gas desulfurization and denitrization system were examined. The system has a preduster low pressure venturi scrubber, activated carbon absorption tower, and heat exchangers. Adsorption is achieved by scrubbing and the acidic liquid waste after adsorption is neutralized by alkali and suspended substances are eliminated before discharging. The amount of carbon was 204 kg each; density, 0.6 kg/l; fuel sulfur content, 2.5%; fuel consumption 50 l/hr; emission gas, 607 N cu m/hr; sulfur dioxide concentration at the entrance, 1,161 ppm; and measurements were taken by infrared analyzer. For about 10 hr, the adsorption efficiency for desulfurization showed no difference between the two sizes of particles; after that 4 m/m diameter was a little better. But when 6 m/m diameter particles were packed to obtain the same surface area as 4 m/m diameter particles, the same efficiency was obtained. Denitrization efficiency was 14%; therefore, SO2 concentration had to be first lowered before passing the gas through carbon layer.

35654 **APTIC NO. 59109**

Imris, Pavel

DISCHARGE ELECTRODE FOR AN ELECTROSTATIC PRECIPITATOR. *(Resource Control, Inc., West Haven, Conn.) U. S. Pat. 3,763,632. 6p., Oct. 9, 1973. 8 refs. (Appl. July 22, 1971, 2 claims).*

A discharge electrode for use in electrostatic precipitators is provided wherein the surface of the electrode is formed of alternate sections of conductive and nonconductive materials supported on an electrically conductive inner rod. When the electrode is in use, corona formation occurs at the interface between the conductive and nonconductive sections. This electrode, having the same size as a conventional electrode, has corona onset potential which is significantly lowered as compared to the conventional electrode while a higher current can also be maintained before spark-over occurs. As a result, an expanded corona region is obtained and a precipitator utilizing such an electrode is operated more efficiently. This discharge electrode can be used with both positive and negative potential, while a corresponding conventional electrode cannot.

35655 **APTIC NO. 58589**

Inoue, Tsutomu, Makoto Tani, Toshiro Hiraoka, Akira Yamamoto, Noboru Mizutani, Keiji Nakanishi, Kenichi Oita, Kenichiro Nishiyama, Tadaomi Nakai, Nobuaki Hannoda, Heitaro Himeji, Tojiro Ito, Hiroshi Hashimoto, and Hiroshi Muranaka

AIR POLLUTION CONTROL IN THE DISTRICT OF THE KIZU RIVER. *(Osaka- shi Kizugawa shuhen tokubetsu taikaku ni tsuite (II)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):505, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper, 235.)*

In the Kizugawa District of Osaka, a strict air pollution control plan was enforced based on the November 1971 of the Osaka s Clean Air Plan. The use of fuels containing less than 1.20% of sulfur, control of the total emissions to 4,293,000 N cu m/yr of sulfur dioxide, achievement of 0.05 ppm environmental standards, enforcement of new installation standards, and dust collection requirements for factories achieved a 20-30% reduction of SOx emission in 1972 as compared to 1971. The new installation requirements of pollutant control equipment were: for electric furnaces, a building dust collector or bag filter collection by direct suction from the furnace top; for basic oxygen furnaces, converters or electrostatic precipitators; for cupolas, bag filters or venturi scrubbers; for sintering furnaces, bag filters; for low cycle electric furnaces, electrostatic precipitators or bag filters; for finishing furnaces, electrostatic precipitators; for wood chip boilers, bag filters, stack gas desulfurizers, electrostatic precipitators, or multicylone and wet dust collectors; and for incinerators, wet dust collectors.

35656 **APTIC NO. 59120**

Ishigaki, Shinichi

DESULFURIZATION OF RESIDUAL FUEL OIL. *(Juyu no datsuryu ni tsuite). Text in Japanese. Sanyo Gijutsu Zasshi (J. Sanyo Assoc. Advan. Sci. Technol.), 26(2):29-36, Dec. 1973.*

The transition of fuel oil and coal consumption, the oil imports of Japan, the oil resources of the world, the main sulfur contents in imported oils, the methods of desulfurization and effectiveness, comparisons of direct and indirect desulfurization systems, and the future trends are discussed. The direct desulfurization system installed at the Japan Mining Co., Mizushima Refinery was chosen, in spite of the technical uncertainty of the direct method, for best suitability to the environment. Its shortcomings are the deterioration of catalytic activity by nickel and vanadium deposits on the catalyst, and corroded ferrous oxide and salt particles in the material oil causing the rise of differential pressure in the reaction tower. Vanadium in the oil changes sulfur dioxide into sulfur trioxide and form sulfuric acid salt on the catalyst and deteriorates hydrogenation activity clogging the pores of the catalyst. Therefore, catalysts must be disposable, inexpensive material. After a period of testing with a pilot plant, the actual system was constructed in 1969, and since then a number of systems have been added. The operation is satisfactory. The system reduces sulfur content of oil from 4% to 1%, and catalysts are changed every six months. Circulated hydrogen gas is scrubbed and hydrogen sulfide is eliminated. The material oil is cleansed before desulfurization and microparticles are eliminated. Corrosion and pollution of the air cooler are carefully avoided.

35657 **APTIC NO. 58342**

Ishihara, Yoshimi

NITROGEN OXIDES REMOVAL PROCESS FOR COMBUSTION FLUE GAS TREATMENT. *(Nensho haigasu shori o taisho to shita dassho gijutsu). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 52(558):771-777, Oct. 1973. 8 refs.*

In developing the process of treatment for nitrogen oxides in flue gas by the denitrization method, the acceleration of response, analysis of interference of coexisting elements and their elimination, and the use of by-product or pollutionless treatment of the end product are necessary. In developing catalytic reduction methods, the problems would be dusts, sulfur dioxide, oxygen in the flue gas, and the treatment of nonresponsive reduction gases. The advantage of the catalytic reduction method is there is no end product, since nitric oxide is reduced to harmless nitrogen. Adsorption methods using silica gel, alumina, molecular sieves, and activated carbon are also being developed; but even the most effective of them all, activated carbon, adsorbs only a fraction of the amount of NOx. Adsorption is more effective at low temperatures; but the 10% steam contained in flue gas condenses at 40 C and produces a great amount of latent heat; therefore it is difficult to cool a large volume of flue gas to below 40 C. The wet absorption method, and the wet reduction method and their principles and problems, are discussed. From the standpoint of by-product use and avoidance of nitrate and nitrite pollution, the dry catalytic reduction method and the wet reduction method are the most desirable.

35658 **APTIC NO. 59057**

Johnson, L. D. and R. M. Statnick

MEASUREMENT OF ENTRAINED LIQUID LEVELS IN EFFLUENT GASES FROM SCRUBBER DEMISTERS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., 14p., Sept. 13, 1973. 4 refs.*

A soluble ion was used as a tracer in a field test of the determination of entrained liquid levels in gases leaving scrubber demisters. Trial measurements were made at two separate alkali scrubbers at power plants. All results, both experimental and calculated, were reasonable and self-consistent. Agreement with independent estimates and practical experience was good. Entrainment accounted for only 0.1 ml of the 100 ml of water recovered by the impingers. Various methods for measuring liquid entrainment are described. (Author abstract modified)

35659 **APTIC NO. 59011**

Jonas, Christian

SOME USES OF PERMEATION FOR SOLVING PROBLEMS OF ENVIRONMENTAL POLLUTION. *(Zu einigen Einsatzmoeglichkeiten der Permeation bei der Loesung von Umweltfragen). Text in German. Akademie der Wissenschaften (East Germany), Zentralinstitut fuer Isotopen-und Strahlenforschung, Leipzig, 20p., 1973. 49 refs. (Presented at the Verfahrenstechnischen Jahrestagung, Halle, June 27-28, 1973.)*

Separation of substances with the aid of selective membrane is still in the initial stages. The elementary processes of permeation are under investigation. Some practical experience with permeation has shown that the method is suitable for a number of applications. The main emphasis of present research rests on the development of suitable membranes with good selective properties at economically favorable throughputs. The most important fields of application for permeation are outlined. Apart from the separation of organic and anorganic substances from waste water and from solutions, the method is suitable for desalination of sea water and for the separation of gaseous components. Separation of gaseous components by the method of permeation is primarily based on the different solubility of gases in the membrane material as well as on the different diffusion velocities of the gases within the membranes. With the knowledge of the dependence of the solubility and diffusion properties on the pressure, temperature, and membrane material it has become feasible to eliminate pollutants such as unsaturated hydrocarbons, hydrogen, and helium from waste gases with membranes of different structure and form. For the concentration of low-methane gases in order to increase their heating value, the method has proved to be suitable, although the throughputs are not satisfactory yet. With the aid of a membrane, methane could be enriched from 20 percent to 85%. Burning such gases in a flare is thus no longer necessary.

35660 **APTIC NO. 59358**

Kamino, Yasumi, Shigenori Onitsuka, Shiro Inoue, and Kenji Yasuda

A STUDY ON DESULPHURIZATION OF FLUE GASES BY THE ACTIVE CARBON PROCESS USING STEAM DESORPTION (PART 5) - DETERIORATION AND REGENERATION OF ACTIVE CARBON. *(Suijoki datsurishiki kasseitanho ni yoru haien datsuryu (daigoho)-Kasseitan no rekha to saisei). Text in Japanese. Hitachi*

Zosen Giho (Hitachi Zosen Tech. Rev.), 34(3):18-21, 1973. 4 refs.

Environmmental conditions contributing to the deterioration of activated carbon were investigated in an effort to clarify the causes of sulfur dioxide adsorption capacity deterioration. Exposure to oxygen at a temperature level of around 300 C demonstrated a large influence on the adsorption capacity of activated carbon to SO2; and further studies showed a relationship between the deterioration in degree of activity and the concentration of O2 in the atmosphere, temperature of the gas, and exposure time to O2. Deteriorated active carbon was regenerated to nearly initial capacity when heated at 500 C and 730 C in a hydrogen stream and a stream of other gases, respectively.

35661 **APTIC NO. 59077**

Kapralek, Jiri

THE INFLUENCE OF SOME PRODUCTION AND ASSEMBLING FAULTS UPON THE PERFORMANCE OF ELECTROSTATIC PRECIPITATORS. *(Vliv nekterych vyrobnich a montaznich nepresnosti na funkci elektrickych odlucovacu). Text in Czech. Zdravot. Tech. Vzduchotech., 16(5):321-326, 1973.*

The principles of electrostatic precipitation are discussed. Special attention is given to the influence of the applied voltage on the particle drift velocity, separation quality, and dust outlet. Some required voltage control qualities, inlet gas parameters, as well as production, assembling, and maintenance influences are discussed.

35662 **APTIC NO. 58356**

Kawamura, Keita, Shinji Aoki, Shoji Hashimoto, Waichiro Kawakami, Kyojiro Abachi, and Sueo Machi

STUDY ON CLEANING OF EXHAUST GASES BY IONIZING RADIATION (REPORT I). *(Hoshasen shosha ni yoru haigasu shori ni kansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):354, 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 98.)*

The possibility of flue gas treatment by ionizing radiation was examined. In the first experiment, fuel oil combustion gas was trapped in a stainless steel reactor bos and given liniac electronic line radiation irradiation. In nine minutes, a clear desulfurization effect was recognized and white aerosol formation was noted. Irradiation conditions were changed and variations were studied. In the second experiment, in order to increase the effect, current irradiation was applied by Cock-Croft-Walton electronic line accelerator in a current irradiation apparatus. A diagram is presented. Fuel oil combustion gas was trapped in the reactor and electronic line was connected with the reactor and continuous irradiation was given. In 10 seconds, more than 90% desulfurization was obtained, and simultaneously, in two seconds, almost complete denitration was achieved. Aerosol formation by irradiation was eliminated by continuous application of electrostatic precipitator. The desulfurization and denitration mechanisms are bein studied.

35663 **APTIC NO. 58880**

Kawasaki, Gunji, Masao Yamasaki, Yasutaka Hosono, Hisao Arakawa, Yukio Aburamoto, and Masami Imai

ON FLUORIDES IN EXHAUST GAS (2). *(Fusso kagobutsu hasseigen chosa ni tsuite --sono 2--tekko kanren kojo hasseigen chosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):362, 1973. (Presented at the Japan. Society of Air Pollution, Annual, Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 106.)*

Six iron and steel factories were investigated for fluoride emissions. Four factories had traceable amount of F in stack gases; one factory with a 25-ton electric furnace utilizing 1-2 kg/ton of steel, had 1.6 mg/N cu m of F, and another factory with one furnace of 40 ton utilizing 10 kg/ton of steel and another furnace of 10 ton capacity utilizing 8 kg/t produced stack gas containing 41.9 mg/N cu m of F. In both factories, the flue gases are treated by bag filters. The highest amount of F was emitted immediately after fluorite is thrown into the furnace, and that reduction of the amount of CaF2 and eliminating gas at the initial stage of CaF2 melting together with slug will decrease F emission considerably. When the treatment was adopted the CaF2 consumption was decreased from 18 kg/ton to 1.4 kg; F emission decreased from 41.9 to 1.3 mg/N cu m.

35664 **APTIC NO. 59113**

Kelley, Charles F.

APPARATUS FOR REMOVING POLLUTANTS FROM GASEOUS EFFLUENT. *(Budwine (W. J.), Carlsbad, N. Mex.) U. S. Pat. 3,763,012. 10p., Oct. 2, 1973. 12 refs. (Appl. April 5, 1972, 9 claims).*

An apparatus for removing pollutants of all types from a gaseous effluent that is moving in a flow path from the source of the gaseous effluent until the cleaned gaseous effluent is discharged to the ambient atmosphere is described. The apparatus includes a separator in the form of a housing having baffles and spray nozzles forming a particular flow path through the separator during which the gaseous effluent is treated by contact with a liquid cleaning solution (such as water) which is discharged from the spray nozzles. The apparatus also includes a burner assembly communicating with the discharge of the separator for final combustion of any residual material contained in the gaseous effluent prior to discharge into the ambient atmosphere. The apparatus is associated with a charcoal forming kiln having a unique structure and association with the control apparatus for more efficiently forming charcoal and effectively removing pollutants from the gaseous effluent from the kiln. In this application, the charcoal kiln has been disclosed to illustrate an effective utilization of the pollutant removing apparatus and it is within the purview of this invention to utilize the pollutant removing apparatus with other devices which have a gaseous effluent containing pollutants. (Author abstract)

35665 **APTIC NO. 58702**

Keranen, T. W. and H. P. Wertheimer

SPARK IGNITION ENGINE CONTROL VARIABLES STUDY. *Preprint, Society of Automotive Engineers, New York, 12p., 1973. 10 refs. (Presented at the Society of Automotive Engineers International Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1973.)*

Systematic testing of a fuel-injected 429 cu in. V-8 engine at steady states produced data from which the effects on emissions of three control variables in combination could be determined. Plotted data of brake-specific nitric oxide, hydrocarbons, and carbon monoxide, as well as brake-specific fuel consumption, are presented as a function of air-fuel ratio, ignition timing, and percent of exhaust gas recirculation (EGR). Analysis of trends shows that EGR permits NO control with less fuel consumption penalty than extremely rich operation alone. Control of NO is important at low power levels as well as high, while HC is much more of a problem at the lowest power levels than at high engine outputs. An optimum engine size for the weight of a vehicle is indicated. Simulation of warm engine emission tests permits comparisons between several control approaches, suggesting entirely different calibrations are indicated for different emission performance goals. (Author abstract)

35666 **APTIC NO. 58537**

Khan, I. M. and C. H. T. Wang

FACTORS AFFECTING EMISSIONS OF SMOKE AND GASEOUS POLLUTANTS FROM DIRECT INJECTION DIESEL ENGINES. *Lucas Eng. Rev., 6(2):36-45, Nov. 1973. 17 refs.*

The fuel injection equipment variables (injection timing, injection rate, and nozzle configuration) and air swirl mainly affect the formation of pollutants through their effect on the details of the fuel-air mixing process, i.e., spatial distribution histories of fuel/air ratio and temperature in the combustion chamber. The exhaust smoke is reduced at a given injection timing and becomes less and less sensitive to the changes in injection timing as the rate of fuel-air mixing is increased. The formation of soot in the diesel engine, and its emission in the engine exhaust, is determined by the combined effect of incompletely mixed fuel at ignition, its equivalence ratio, and temperature history during the main combustion periods. The fuel injection variables, through their effect on the fuel-air mixing process, affect these fundamental factors. The same applies to nitric oxide formation in the diesel engine with the difference that the two fundamental factors in this case are the equivalence ratios in, or in the proximity of, zones where intense reactions occur and the associated temperatures. An increase in the rate of fuel-air mixing, in combination with a retard in timing, may be used to reduce the emissions of NO from a direct injection diesel engine without affecting exhaust smoke levels and without any substantial increase in fuel consumption.

35667 **APTIC NO. 58796**

Klodt, Donald T.

CORROSION OF AIR POLLUTION CONTROL EQUIPMENT IN THE MINERAL INDUSTRIES. *Mineral Industries Bulletin, 16(1):1-14, Jan. 1973. 58 refs.*

An overview of corrosion problems in air pollution control equipment is presented based on a review of the literature with some criteria histories as illustrations of the basic problems encountered. Major types of control equipment for dusts and mists are mechanical, cloth or fabric collectors, liquid scrubbing, and electrostatic precipitation. Equipment selection and design, performance and efficiency, and operational problems due to corrosion are discussed. The range of particles sizes, concentrations, and collector performance are presented in a diagram. Corrosion losses of metals and alloys and the preventive measures taken to reduce or eliminate the corrosion problems amount to at least $10 billion each year in the U. S. Case histories are presented of corrosion in sulfuric acid plants, corrosion of an electrostatic precipitator on a basic oxygen steelmaking furnace, corrosion of a gas scrubber, and stress corrosion of induction fans. Steps to overcome or mitigate corrosion are reviewed. The effects and mechanisms of corrosion are outlined.

35668 **APTIC NO. 58333**

Kuwahara, Hiroshi

DESULFURIZATION OF HEAVY OIL. *Chem. Economy Eng. Rev., 5(10):35-40, Oct. 1973.*

Processes for heavy oil desulfurization and gasification are reviewed. The gasification process which involves the heating of heavy oil to make a gaseous fuel and the cracking of sulfur compounds in the oil for conversion to hydrogen sulfides to be recovered can be accomplished either by partial oxidation, to generate a gas consisting mainly of hydrogen and carbon monoxide, or by cracking with high-temperature steam, in order to produce chemical raw materials or fuels such as gas, gas oil, and pitch. A combination of the gasification process and a power generating plant has been proposed to resolve problems encountered in partial oxidation and to insure more effective use of resources. The heavy oil thermal cracking processes now available include the flexicoking process and the delayed coking process. The flexicoking process, with its high yield of liquid products, is particularly suited for incorporation into the existing oil refining system. Desulfurization of fuel oil is commercially carried out at present almost entirely by the hydrocracking process (hydrodesulfurization process); operating conditions are severe, hydrogen consumption large, and catalyst activity impaired by the presence of metals in the feedstock.

35669 **APTIC NO. 59278**

Lardit, F.

PARTICULAR TECHNICAL ASPECTS OF ELECTRIC DUST SEPARATORS, AND ESPECIALLY OF ELECTROSTATIC DUST PRECIPITATORS IN MUNICIPAL WASTE INCINERATORS. *(Aspects particuliers de la technique des depoussiereurs electriques et notamment des electrofiltres en incineration d ordures menageres). Text in French. Rev. Gen. Thermique (Paris), 12(142):999-1012, Oct. 1973.*

Technical and design aspects of electrostatic dust precipitators intended for use in municipal waste incinerator plants are presented. The hot waste gases from the waste incinerator have to be brought to 250-350 C by direct or indirect cooling with heat recovery, or by dilution with fresh air for dust separation in electrostatic precipitators. As electrostatic precipitators are unable to retain light pieces of burned paper, such flakes should be removed before the gas enters the dust separator. Relative increases in the unburned matter content in the dust leaving the electrostatic precipitator as compared with the unburned matter content at the inlet was determined. As the errors involved in the determination of the efficiency of electrostatic dust precipitators are in the order of magnitude of 20%, electrostatic dust separators should be designed for a residual dust concentration of 120 mg/N cu m instead of the adopted maximum allowable concentration of 150 mg/N cu m, or for an efficiency of 99.2% instead of 99%. Multisectional electrostatic precipitators have positive advantages before single-section designs for reliability.

35670 **APTIC NO. 59206**

Lawson, L. J.

KINETIC ENERGY STORAGE: A NEW PROPULSION ALTERNATIVE FOR MASS TRANSPORTATION. *Preprint, American Society of Mechanical Engineers, New York, 9p., 1973. 7 refs. (Presented at the American Society of Mechanical Engineers Intersociety Conference on Transportation, Denver, Colo., Sept. 23-27, 1973, Paper 73-ICT-10.)*

The kinetic energy flywheel is discussed as a highly effective energy storage system for use either in heat engine/flywheel hybrid or pure flywheel-drive configurations. The specific energy of present day flywheels is sufficient to make flywheel only vehicles practical for urban route applications with ranges up to 30 km (18.6 mi). Activity has also been directed toward practical flywheel-only drives for mass transportation vehicles. The optimum approach to providing nonpolluting efficient electric coaches (trackless trolleys) for the San Francisco Municipal Railway is being determined. Existing vehicles are being retrofitted to establish the acceptability of kinetic energy vehicles in revenue transit services. The dual mode electric coaches used for the demonstration will be capable of providing scaled operational data that can be extrapolated to new classes of ecologically and socially acceptable vehicles.

35671 **APTIC NO. 58515**

Lee, A. K. K.

LATTICE THEORY CORRELATION FOR BINARY GAS ADSORPTION EQUILIBRIA ON MOLECULAR SIEVES. *Can. J. Chem. Eng., 51(6):688-693, Dec. 1973. 20 refs.*

A correlation method is presented for calculating the adsorption equilibria of a binary gaseous mixture and the total amount adsorbed, using pure-component adsorption isotherms and a mixture parameter. The proposed method is based on the lattice theory of solutions and the concept of volume filling of microporous adsorbents. The former provides an expression for the free energy of mixing pure components in the adsorbed phase and the latter provides expressions for calculating the adsorbed phase molar volumes and the free energies of adsorption of the pure components and the binary mixtures. A binary equilibrium correlation equation is derived by equating free energies of adsorption. By introducing a single mixture parameter into the free energy of mixing, the correlation equation can be used for quantitative representation of binary equilibria. The method has been successfully applied to literature data for the adsorption of binary gas mixtures in molecular sieves type 5A, type 10X, and H-mordenite. (Author abstract modified)

35672 **APTIC NO. 58577**

Maki, Katsumi, Akira Kosaka, Ryohei Enoki, and Yoshiharu Nishimura

THE REMOVAL OF HYDROGEN SULFIDE FROM COKE OVEN GAS AND RECOVERY OF ALKALI. *(Kokusuro gasu no datsuryu to arukari no kaishu ni tsuite). Text in Japanese. Aromatikkusu Aromatics, 25(11-12): 470-472, 1973.*

The Takahax desulfurization system at the Nissan Engineering Co. (developed by Kawasaki Ironworks) with the treatment capacity of 25,000 N cu m/hr was completed in Nov. 1970 and has been in operation with a satisfactory desulfurization rate. The system had the problem of extraordinary consumption of alkali due to formation of salts by the reaction of hydrogen cyanide and alkali in the absorbent. A method of recovering alkali from the by-product salts was developed, and has been added to the plant. The recovery-recirculation system has been working satisfactorily since May 1973. The recovery is achieved by thermodecomposition in a reduced atmosphere. The concentration liquid (0.5 cu m/hr) is sprayed into the decomposition furnace by steam atomizer. The furnace is kept at a reduced atmosphere by combustion (air ratio 0.6) of the coke furnace at 800-850. Decomposed substances flow down and are cooled in the drain. This is gathered and returned to the system. Minor problems of clogging of the furnace wall and exit by reaction products and low decomposition rates were corrected. By improvements made on the spray nozzle, clogging of the furnace exit was resolved and decomposition rate improved.

35673 **APTIC NO. 58955**

Maselli, James Michael, Michael Vance Ernest, and Gwan Kim

CATALYST FOR CONTROL OF AUTOMOBILE EXHAUST EMISSIONS. *(Grace W. R. and Co., New York) U. S. Pat. 3,764,564. 4p., Oct. 9, 1973. 2 refs. (Appl. May 11, 1972, 4 claims).*

A process for preparing an automotive exhaust catalyst capable of converting the carbon monoxide and hydrocarbons in automobile exhaust gas to carbon dioxide and water is described. It is characterized by high activity and exceptional resistance to shrinkage in use. The catalyst is prepared by impregnating or cladding nodules of a support with certain transition metal oxides. One of these oxides is impregnated into or clad onto the support and the support is calcined prior to addition of the other catalytic components to the nodules. (Author abstract)

35674 **APTIC NO. 59076**

Mejzr, Josef

CYCLONE-TYPE DUST COLLECTORS MANUFACTURED BY ZVVZ IN MILESKO. *(Cyklonove odlucovace ze ZVVZ Milevsko). Text in Czech. Zdravot. Tech. Vzduchotech., 16(5):251-258, 1973.*

A history of mechanical dust collecting equipment production in Czechoslovakia from the end of World War II to the present is given. Present collectors and cyclone equipment are described, designs are shown, efficiencies are discussed, and fields of application are mentioned. The trends for the future are discussed.

35675 **APTIC NO. 59111**

Merriman, James R., John H. Pashley, Michael J. Stephenson, and David I. Dunthorn

PROCESS FOR THE SEPARATION OF COMPONENTS FROM GAS MIXTURES. *(Atomic Energy Commission, Washington, D. C.) U. S. Pat. 3,762,133. 14p., Oct. 2, 1973. 6 refs. (Appl. Oct. 15, 1971, 10 claims).*

A process for the removal from gaseous mixtures a desired component selected from oxygen, iodine, methyl iodide, and lower oxides of carbon, nitrogen, and sulfur is described. The gaseous mixture contacts a liquid fluorocarbon in an absorption zone maintained at superatmospheric pressure to preferentially absorb the desired component in the fluorocarbon. Unabsorbed constituents of the gaseous mixture are withdrawn from the absorption zone. Liquid fluorocarbon enriched in the desired component is withdrawn separately from the zone, following which the desired component is recovered from the fluorocarbon absorbent. Among the more important applications of this invention are the removal of low level contaminants from gas streams and the production of highly concentrated oxygen from air. (Author abstract modified)

35676 **APTIC NO. 59498**

Miller, Kenneth J.

FLOTATION OF PYRITE FROM COAL: PILOT PLANT STUDY. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Energy Research Center, Rept. RI 7822, 18p., 1973. 2 refs.*

Pittsburgh bed and Lower Freeport bed coals were tested in the Bureau of Mines two-stage froth flotation pilot plant which utilizes a new flotation process to remove pyritic sulfur. The process consists of a first-stage coal flotation step to remove coarse, free pyrite and other refuse in the tailings; clean coal froth concentrate is then repulped and treated with a coal depressant, a pyrite collector, and a frother to selectively float the remaining pyrite in a second stage. Pilot results were excellent and compared well with those obtained in laboratory batch tests. About 70% of the pyrite present in the Pittsburgh bed coal and about 90% of the pyrite present in the Lower Freeport bed coal were removed with excellent final clean coal recoveries. (Author abstract modified)

35677 **APTIC NO. 58979**

Motina, G. L., V. A. Yeremina, D. M. Zhuravlev, V. A. Yakovlev, and Ye. S. Bylinkina

TESTING METAL-CERAMIC POROUS FILTERS FOR THE STERILIZING FILTRATION OF AIR BY MEANS OF POTASSIUM DICHROMATE AEROSOL *(Ispytaniye metallokeramicheskikh poristykh fil trov dlya steriliziruyushchey fil tratsii vozdukha s pomoshch yu aerozolyakhrompika). Text in Russian. Khim.-Farm. Zh. (Moscow), 7(11):45-48, 1973. 9 refs.*

Four different metal-ceramic porous filters were tested for their efficiency in the sterilizing filtration of air. The efficiency was determined by the retention of potassium bichromate and oil aerosols. Reduction in the rate of retention with increasing rate of filtration was determined. The required 98% efficiency was guaranteed at filtration rates ranging from 0.5 to 2 cm/sec. Two-stage filtration by means of two series-connected metal-ceramic filters proved to be most effective. The filters were considerably more effective for potassium dichromate aerosol than they were for oil aerosol.

35678 **APTIC NO. 59136**

Mueller, Friedrich

ABATEMENT OF MOTOR VEHICLE-GENERATED AIR POLLUTION. *(Verminderung der durch Kraftfahrzeuge verursachten Abgasbelaesugungen). Text in German. Wiss. Z. Tech. Univ. Dresden, 22(4):651-652, 1973. (Presented at the Conference on Socialist Environmental Patterns, Dresden, East Germany, Nov. 21-24, 1972.)*

General problems and possible ways of the abatement of motor vehicleegenerated air pollution in East Germany are outlined. Systematic pollutant concentration measurements conducted in Berlin revealed linear relationship between the lead, hydrocarbon, carbon monoxide, and nitrogen oxide concentrations and the traffic density. The maximum allowable concentrations of lead, soot, nitrogen dioxide, benzene, CO, and hydrocarbon concentrations are set at 0.0007; 0.05; 0.085; 0.8; 1.0, and 1.5 mg/cu m, respectively. The current reduction in the share of two-stroke engine-powered vehicles will entail an increase in the nitrogen oxide concentrations, and possibly a reduction in the hydrocarbon emissions. Battery-powered vehicles, due to large weight of the battery and fuel cell-powered vehicles most probably will not become valid alternatives for conventional engine-powered vehicles in the rest of this century. Catalytic afterburning is unacceptable due to the increased fuel consumption involved. Improvements of mixture formation, distribution, and combustion will be the most essential approaches to the problem of exhaust emission abatement.

35679 **APTIC NO. 58683**

Nishida, Konosuke

AIR POLLUTION CONTROL ON NOX. *(Chisso sankabutsu ni yoru taiki osen to sono boshi). Text in Japanese. Sangyo Kogai Boshi Gijutsu (Ind. Pollut. Control Tech.), no. 2:1-36, July 1973. 36p.*

Emission sources of nitrogen oxides, emission sources in Kyoto, the principles of photochemical reactions, and elimination methods of NOx by water, oxidation, photochemical reaction, alkaline absorption, ammonia, ferric sulfide, nonselective reduction, selective reduction, and adsorption are reviewed. The NOx absorption efficiency of water was tested by packed tower, spray tower, bubble cap tower, and glass filter. The elimination rates of the packed tower, spray tower, and silica gel absorber were low. The rates of the glass filter and buttle cap tower were similar. Therefore, the best result if obtained by a combination of the bubble cap tower with a multiple number of small gas outlets inside the bubble cap. This will enlarge the contact area and increase the absorption rate. Venturi scrubbers are also effective.

35680 **APTIC NO. 58666**

Norgren, Carl T. and Robert D. Ingebo

EFFECT OF FUEL VAPOR CONCENTRATIONS ON COMBUSTOR EMISSIONS AND PERFORMANCE. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA TM X-2800, Rept. E-7336, Work Unit 501-24, 34p., June 1973. 11 refs.*

Effects of fuel vaporization on the exhaust emission levels of oxides of nitrogen, carbon monoxide, total hydrocarbons, and smoke number were obtained in an experimental turbojet combustor segment. Two different fuel injectors were used in which liquid ASTMA-1 jet fuel and vapor propane fuel were independently controlled to simulate varying degrees of vaporization. Tests were conducted over a range of inlet-air temperatures from 479 to 700 K (860 to 1260 R), pressures from 4 to 20 atm, and combustor reference velocities from 15.3 to 27.4 m/sec (50 to 90 ft/sec). Converting from liquid to complete vapor fuel resulted in NOx reductions of as much as 22% and smoke number reductions up to 51%. Supplemental data are also presented on flame emissivity, flame temperature, and primary-zone liner wall temperature. The effects of fuel vaporization on air-fuel ratio, inlet-air temperature, inlet pressure and inlet velocity were studied at different engine operating cycles. (Author abstract modified)

35681 **APTIC NO. 58602**

Omichi, Sadao, Hikotaro Yoda, and Yoshihiro Matsuoka

MEASUREMENT OF AIR POLLUTANTS BY FIELD TEST AIR CHAMBER. *(Yagai kikken chanba no taiki osen busshitsu no sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc Air Pollution), 8(3):540, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th Fukushima, Japan, Nov. 6-8, 1973, Paper 266.)*

Performance tests were given to air filters for a field test chamber designed specially for analyzing air pollutant effects on agricultural produce. The chamber is made of two separate rooms in an iron frame covered by translucent phylon sheets. The supply and ventilation of air is achieved by fans, and one room has air cleaning filters and the other has no filters. The efficiency of two types of filters was tested singly and in combination. One is an activated carbon filter pack and the other is a cloth filter treated by manganese. A new carbon filter eliminated 85.7% of ozone, 49.1% of sulfur dioxide, zero% of nitric oxide, and 46.2% of nitrogen dioxide; a new MnO2 filter eliminated 24.2% of O3, 74% of SO2, zero% of NO, and zero% of NO2. The effectiveness of year-old filters singly was both extremely poor. When used in combination, the new filters eliminated 89.2% of O3 and 86.8% of SO2, and 46.2% of NO2; year-old filters in combination eliminated 82.7% of ozone and 45.2% of SO2, which was condiserably better than the single use.

35682 **APTIC NO. 59342**

Ottofy, Frank B.

ANTI-POLLUTION DEVICE FOR AND METHOD OF REMOVING OIL FROM AIR VENTED FROM THE CRANKCASE OF AN INTERNAL COMBUSTION ENGINE AND RETURNING THE OIL TO THE CRANKCASE. *(Assignee not given.) U. S. Pat. 3,765,386. 4p., Oct. 16, 1973. 5 refs. (Appl. June 16, 1971, 9 claims).*

An anti-pollution device and method for removing oil from air vented from the crankcase of an internal combustion engine and returning it to the crankcase have been developed to reduce carbon monoxide and other exhaust increases usually associated with feeding the oil vapors back to the intake manifold; the method also decreases spark-plug fouling. The device consists of an elongated casing packed with wire mesh and having an inlet at one end which is connected to the positive crankcase ventilation valve and an outlet at the other end which is connectible to the intake manifold. An oil detection final filter is provided near or at the outlet end of the casing. A drain outlet for oil removed from the oil-laden air drawn through the wire mesh is provided and includes a check valve which is closed during operation of the engine and open for oil drainage purposes when the engine is shut off. (Author abstract modified)

35683 **APTIC NO. 58337**

Oya, Masaaki

CONTROL TECHNIQUES FOR NITROGEN OXIDE FROM STATIONARY SOURCES. *(Kotei nensho sochi kara noNOx haishutsu boshi gijutsu). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 52(558):766-770, Oct. 1973. 10 refs.*

The emission coefficients of various nitrogen oxides emission sources in the Tokyo Bay area are given for automobiles, power plants, diesels, steel industry, blast furnaces, coke furnaces, sintering furnaces, incineration, and fuel combustion. Between 1960 and 1970, the amount of total NOx emission in the Tokyo Bay area quintupled; by 1975, it will increase to over 50% more than the total 1970 emission. The methods of control suggested are: the two-stage combustion air supply and recirculation of combustion gas. By supplying 90-95% of combustion air in the first stage in the burner area, and 15% of air in the upper flame, it is reported that 24 to 47% of NOx gas can be reduced. Recirculation of combustion gas or mixing it with combustion air will reduce the oxygen concentration and lower the combustion temperature.

35684 **APTIC NO. 58962**

Pennachetti, John T. and Joseph F. Boux

PROCESS FOR THE TREATMENT OF FLY ASH. *(Enercon International Ltd., Hamilton, Ontario) U. S. Pat. 3,769,054. 5p. Oct. 30, 1973. 1 ref. (Appl. April 26, 1972, 3 claims).*

A complete and economically attractive utilization of fly ash material is made possible by a process that provides a multiplicity of valuable products comprising an iron concentrate product, an improved pozzolan product and a carbon product which are also claimed, and an agglomerate product of uniform quality. The process includes the steps of air classification, carbon product removal, iron separation, and agglomeration of a fly ash material. Such a process has the advantage of fully and completely utilizing all of the fly ash to form economically attractive products. This is the same as U. S. Pat. 3,769,053 but contains an additional claim.

35685 **APTIC NO. 58983**

Pennachetti, John T. and Joseph F. Boux

PROCESS FOR THE TREATMENT OF FLY ASH. *(Enercon International Ltd., Hamilton (Ontario)) U. S. Pat 3,769,053. 5p., Oct. 30, 1973. 1 ref. (Appl. April 26, 1972, 2 claims).*

A complete and economically attractive utilization of fly ash material is made possible by a process that provides a multiplicity of valuable products comprising an iron concentrate produce, an improved pozzolan product and a carbon product which are also claimed in the invention, and an agglomerate product of uniform quality. The process includes the steps of air classification, carbon product removal, iron separation, and agglomeration of a fly ash material. Such a process has the advantage of fully and completely utilizing all of the fly ash to form economically attractive products. This is the same as U. S. Pat. 3,769,054 but it has one less claim.

35686 **APTIC NO. 58976**

Pheline, Jean and Philippe Vesseron

ABATEMENT OF THE SULFUR OXIDE EMISSIONS IN THE FOS-ETANG DE BERRE REGION. *(Reduction des emissions d oxydes de soufre dans la zone de Fos-Etang de Berre). Text in French. Ann. Mines (Paris), Nov.-Dec. 1973:75-102, 1973.*

An economic and technical study of various options for the abatement of the sulfur dioxide emissions in the Fos-Etang de Berre industrial area, comprising major petrochemical, chemical, metallurgical industries, and thermal power plants is described. The use of high stacks, low-sulfur fuels (especially in emergency situations), fuel and flue gas desulfurization, and as the use of nuclear energy are the basic options for SO2 emission control. Automatic monitoring and alarm networks will be installed. The use of sulfur-containing vacuum distillates in thermal power plant units equipped with flue gas desulfurizers, and a change of the planned site of conventional power plant units are also envisaged. Desulfurization of heavy fuel oils, flue gas desulfurization in certain power plant units, and waste gas treatment in chemical and metallurgical plants are necessary.

35687 **APTIC NO. 59471**

Postma, Norman D., Rob Van Giessel, and Frits Reinink

THE STIRLING ENGINE FOR PASSENGER CAR APPLICATION. *Preprint, Society of Automotive Engineers, Inc., New York, 23p., 1973. (Presented at the Society of Automotive Engineers, Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, Ill., June 18-22, 1973, Paper 730648.)*

A detailed theoretical and experimental study program conducted by Ford Motor Company and N. V. Philips of Holland is described for performance and emission tests on a 170 brake hp Stirling engine which was designed for a 1972 Ford Torino. The Stirling engine employed was different from conventional piston engines in that heat was added by an external flame through a heat exchanger (heater head) to the working gas inside the engine rather than being supplied by burning a quantity of fuel inside the chamber. Results of CVS (constant volume sampling) testing, using a dynamometer to simulate low mileage performance, indicated that hydrocarbons, carbon monoxide, and oxides of nitrogen were all well below the 1976 standard, their values in g/mi being respectively 0.20, 1.20, and 0.14.

35688 **APTIC NO. 58990**

Reilly, Bertram B.

GAS SCRUBBER. *(Assignee not given.) U. S. Pat. 3,765,659. 5p., Oct. 16, 1973. 4 refs. (Appl. Jan. 17, 1972, 3 claims).*

A gas cleaning apparatus for removing particulate matter from gases which has a vertical passage through which the gases flow upward with water-containing trays across the passage at spaced levels is described. Each tray has a perforated bottom and an impingement plate spaced a short distance above the bottom and the tray bottom and impingement plate each have holes through which the gases pass. The holes in the impingement plate are slightly larger than those in the bottom and staggered so that the holes of the bottom are under solid areas of the impingement plate. There are spray nozzles under the trays at each level for cleaning. The holes through the bottom and the impingement plates of each tray are progressively smaller than the corresponding holes in the trays beneath, but the number of holes in the corresponding parts of each tray increases upwardly above the bottom one so that the total area of the openings through the elements of the trays at each level is substantially the same. The invention is especially designed for use in removing tiny particulate solids which predominantly range downwardly from around 50 microns in size from gases generated in the burning of municipal waste in an incinerator. (Author abstract modified)

35689 **APTIC NO. 58972**

Robinson, Ernest B., Shelton Ehrlich, and John W. Bishop

APPARATUS FOR BURNING SULFUR CONTAINING FUELS. *(Dept. of the Interior) U. S. Pat. 3,763,830. 9p., Oct. 9, 1973. 4 refs. (Appl. Jan. 24, 1973, 5 claims).*

A combustion apparatus for the removal of sulfur oxides from fuels containing sulfur is described. A first and second fluidized bed boiler having heat exchange surfaces that burn the S fuels are positioned adjacent to each other with the second bed having less heat exchange than the first. Each bed has solid particulate S acceptors that are circulated between the two beds. Heat exchange wall members between the beds semi-isolate them from each other that there is little or no mixing of the gaseous combustion products from each boiler. The circulation between beds may be accomplished by ports in the exchange wall below the top of the fluidized beds. The end result is the gas emitted to the atmosphere from the beds after additional processing is depleted in sulfur oxides. (Author abstract)

35690 **APTIC NO. 58970**

Rockwell, Harry Brown

COMBINATION FRAME AND EXHAUST SYSTEM FOR MOTOR VEHICLES. *(Assignee not given.) U. S. Pat. 3,763,950. 7p., Oct. 9, 1973. 9 refs. (Appl. Dec. 17, 1971, 5 claims).*

A combination frame and exhaust system for motor vehicles is described. The exhaust gases are led through a conduit formed as part of the frame with a relatively long distance to cool the exhaust gases and silence the noise of the motor. The conduit extends several times around the loop of the frame in order to provide sufficient length to produce the required cooling and silencing. Both water and oil may be introduced into the conduit to assist in eliminating pollutants from the system. (Author abstract)

35691 **APTIC NO. 59450**

Ross, Richard D.

THE CONTROL OF NITROGEN OXIDES. *Preprint, 14p., 1973. 13 refs. (Presented at the Pollution Engineering and Equipment Exposition and Conference, 3rd Annual, New York, May 1973.)*

Control methods for nitrogen oxide emissions are reviewed; and estimated costs and percentages of NOx reduction are listed for such control methods as low excess air, two-stage combustion, low excess air plus two-stage combustion, flue gas recirculation, low excess ari plus flue gas recirculation, and water injection. Two-stage combustion, catalytic reduction, or flue gas recirculation are preferred for high concentrations of NOx, as found in nitric acid or nitrating operations. Two-stage combustion requires less auxiliary fuel than flue gas recirculation, and the advantage of this system is that initial reaction is carried out at substoichiometric conditions with subsequent recovery of heat before oxygen is added to complete the reaction. Flue gas recirculation requires additional fuel to heat the recirculated flue gas. The best solution for reducing NOx in normal fuel combustion is stoichiometric combustion of the fuel with air in a device which will provide for some internal recirculation of the flue gas; current burner designs have this feature. Water injection has been utilized on an experimental basis, but it has an undesirable effect for steam or power generation because it reduces the thermal efficiency of the system. Catalysts are limited to a maximum temperature of 1500 F in most cases and require excess fuel present to keep nitrogen fixation to an absolute minimum.

35692 **APTIC NO. 59249**

Rovesti, William C. and Ronald H. Wolk

DEMETALLIZATION OF HEAVY RESIDUAL OILS. (FINAL REPORT). *Hydrocarbon Research, Inc., Trenton, N. J., Environmental Protection Agency Contract 68-02-0293, Program Element 1AB013, ROAP 21ADD-50, EPA-650/2-73-041, 151p., Dec. 1973.*

An improved demetallization catalyst was developed so that residual oil with high-sulfur and high-metal content could be desulfurized economically. Twenty-eight catalysts were prepared, representing a number of combinations of supports and promoters. Impregnating 20 by 50 mesh granulated activated bauxite with promoters provided the necessary catalytic activity and resistance to poisoning. The residua that were demetallized were Tia Juana, Bachaquero, and Gach Saran vacuum residua. Indications are that these residua can be economically desulfurized to 0.5 weight percent sulfur fuel oil. Economic analysis indicated that the fuel oil could be produced for $1.19, $1.46, and $1.64 per barrel for the Gach Saran, Tia Juana, and Bachaquero residua, respectively, in a U. S. Gulf Coast facility with a capacity of 20,000 barrels per day. These costs include hydrogen, catalyst, operating expenses, and capital charges of 25% of investment. (Author abstract modified)

35693 **APTIC NO. 58963**

Ruiz, Rene A.

ANTI-POLLUTION AND HYDROMOGENIZATION. *(Assignee not given.) U. S. Pat. 3,766,716. 6p., Oct. 23, 1973. 9 refs. (Appl. Aug. 30, 1971, 3 claims).*

An anti-pollution device which takes up only a small amount of space so that it can be installed along any part of a smokestack is described. It is practically 100% effective in the removal of solids, gases, and liquids of harmful nature from a smoke. The device has a preliminary filter unit including perforate plates with charcoal lumps thereon, liquid spray jets, a cap for deflecting smoke past the spray and through the filter unit, and a tank including liquid maintained at a level sufficient to submerge the lower ends of the filter walls therein whereby the smoke passes directly from the filter through the liquid for discharge to the atmosphere. (Author abstract modified)

35694 **APTIC NO. 58743**

Saito, Takeshi and Masatoshi Nabetani

SURVEYING TESTS OF DIESEL SMOKE SUPPRESSION WITH FUEL ADDITIVES. *Preprint, Society of Automotive Engineers, New York, 9p., 1973. 3 refs. (Presented at the Society of Automotive Engineers, International Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1973.)*

Of 18 barium-containing additives, six showed a remarkable effect in smoke reduction; they contained Ba over 1 g/l of fuel. The effect was proportional to Ba content. It was not influenced by engine operating conditions of smoke reduction. The additives increased fuel consumption by about 3%. The influence on engine performance was negligible. Additives caused a slight increase in exhaust carbon monoxide, but decreased nitric oxide. Hydrocarbons were not influenced. The Ba compounds emitted in the exhaust were 85-90% of that supplied in the fuel. The emitted Ba was 85-90% insoluble (barium sulfate). Solids were smaller than 0.8 micron. In over-the road tests of city diesel buses in Japan, engine deposits due to Ba compounds increased somewhat, but did not cause wear of engine parts. Although the Ba compounds in engine exhausts are mostly insoluble BaSO4, there is still a suspicion that they could cause chronic Ba poisoning, and further investigation is warranted. (Author conclusions modified)

35695 **APTIC NO. 58974**

Sajus, L.

STUDIES AND RESEARCH BEING CONDUCTED ON DESULFURIZATION IN FRANCE. *(Etudes et recherches francaises sur la desulfuration). Text in French. Ann. Mines (Paris), Nov.-Dec. 1973:47-54, 1973.*

Studies and research being conducted in France concerning the desulfurization of light and heavy petroleum products and of flue gases are described. While the desulfurization of light oils creates practically no problem, that of heavy fractions is difficult due to increased viscosity and clogging of the catalyst pores. A new hydrodesulfurization procedure developed by the Institut Francais de Petrole envisages pretreatment of the charge for the protection of the catalyst, hydrogen recycling under 80 kg/sq cm pressure, and charge preheating to a catalysis temperature of 360-380 C. The indirect desulfurization of the heavy residues with the asphaltenes present requires fractionation to one fraction containing the asphaltene derivatives and the most viscous compounds, as well as the bulk of metals and sulfur, and another fraction which is subsequently desulfurized. The hydrogen sulfide liberated during the desulfurization process is burned to sulfur dioxide and then reduced to elemental sulfur. A pilot plant for the desulfurization of SO2-containing flue gases by means of aqueous ammoniacal solution was put into operation.

35696 **APTIC NO. 58836**

Sakai, T. and T. Matsumoto

COMMENTARY ON MITSUI CATALYTIC CONVERTER. *(Shokubai hoshiki joka sochi - Mitsui shokubai hoshiki konbata ni tsuite). Text in Japanese. Jidosha Gijutsu (J. Soc. Autmot. Engrs. Japan), 27(11):1277-1279, Nov. 1973. 4 refs.*

A catalytic afterburner for automotive emission control is described. A four-mode driving test of initial activity showed average removal efficiencies of 96.5% for carbon monoxide, 81.9% for hydrocarbons, and 15.1% for nitrogen oxides. Lead accumulation lowered the efficiency of the catalyst after 30,000 km driving time. When lead-free liquefied petroleum gas was used, the life expectancy of the catalyst was 100,000 km. Power loss due to the use of the catalytic converter system ranged from 0.7-4.2%, depending on the driving speed and type of automobile. Effects of temperature on various automobile parts were measured at 90 km/hr on different gradients and wear was considerable. A mileage of 13.0 km/l was obtained for a car which achieved 13.2 km/l with a conventional muffler. A recently developed catalyst, MB-T, has a higher HC removal efficiency and a lower temperature is required.

35697 **APTIC NO. 58896**

Sallee, J. M.

THE COMBUSTION OF NATURAL GAS AND ENVIRONMENTAL PROBLEMS. *(La combustion du gaz naturel et les problemes d environnement). Text in French. Rev. Gen. Thermique (Paris), 12(142):981-988, Oct. 1973.*

The environmental advantages of the use of natural gas as a fuel are described. Due to its gaseous state, natural gas can be fired under well-controlled conditions, and since it is composed of pure, light, saturated hydrocarbons with only trace amounts of impurities, it gives rise to practically no air pollution. Nitric oxide, subsequently oxidized to nitrogen dioxide, is the only pollutant emitted by natural gas firings. Nitric oxide is formed in the zone of maximum temperature, and consequently its formation is the function of the flame temperature, the hold time of the gas in the flame, and the rate of gas cooling. Reduction of the flame temperature, two-stage combustion, water injection into the flame, and flue gas treatment by means of catalysts, scrubbing, and absorbers are the essential ways of reducing NO emissions from natural gas firing equipment.

35698 **APTIC NO. 58989**

Schaltenbrand, Eugene D.

FABRIC TUBE TYPE DUST COLLECTOR METHOD. *(American Air Filter Co., Louisville, Ky.) U. S. Pat. 3,766,712. 5p., Oct. 23, 1973. 5 refs. (Appl. Dec. 14, 1971, 4 claims).*

An arrangement is provided such that static electrical charges on the surfaces of dust collector fabric tubes are dissipated before the cleaning cycle is initiated, thereby increasing the efficiency of the cleaning cycle. A method is provided for collecting contaminant particles from a dirty gas stream including the cycle steps of passing the gas stream through a system-defined passageway which includes passing the gas stream into an open end of and through the walls of at least one gas pervious fabric tubular collector at a pressure and velocity sufficient to maintain the fabric tube in inflated form with the contaminant particles in the dirty gas stream collecting on the surface of the walls of the fabric tubular collector. At this point the collector is cleaned by stopping the flow of the dirty gas stream, providing a null period to allow static electrical charges to dissipate to ground, and passing a clean gas stream in a reverse direction though the isolated tube at sufficient pressure and velocity and for a sufficient time interval to at least partially collapse the fabric tube of the collector and to crack the contaminating cake collected thereon. This method is less expensive and more efficient than previous maintenance methods, such as rapping, and may be used in operations requiring high temperatures, such as in the cement, steel, or carbon industries. (Author summary modified)

35699 **APTIC NO. 59091**

Schneider, P. and E. Uhlmann

AIR POLLUTION--CONTROL OF ATMOSPHERIC EMISSIONS FROM SOLVENT-STORAGE TANK FARMS. *Chem. Rundshau (Solothurn), 26(13):23, March 28, 1973.*

The problem of solvent emissions from solvent storage tanks is described. Due to temperature changes and during filling operations, part of the solvent vapor and air mixture in the space above the liquid level of a large storage tank is discharged through the vent into the atmosphere. To control these emissions, the amount of escaping vapor should be determined. This can be calculated by considering breathing losses, filling losses, and withdrawal or emptying losses theoretically. An exmaple of the calculation is given for methylene chloride. Breathing loss control measures include the use of reflective paint for the tank shell and roof, insulation of the tank, cooling of the tank surface, reduction of exposure to the sun. Filling losses can be reduced by condensation or adsorption of the solvents. Only the construction of a floating roof tank guarantees a simultaneous reduction of both breathing and filling losses. Withdrawal losses are very small and for all practical purposes can be ignored.

35700 **APTIC NO. 59218**

Schweikert, John F. and John H. Johnson

A TURBOCHARGED SPARK IGNITION ENGINE WITH LOW EXHAUST EMISSIONS AND IMPROVED FUEL ECONOMY. *Preprint, Society of Automotive Engineers, Inc., New York and Motor Equipment Manufacturers Assoc., 16p., 1973. 11 refs. (Presented at the Society of Automotive Engineers, Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, Ill., June 18-22, 1973, Paper 730633.)*

A turbocharged multicylinder spark ignition engine with thermal reactors and exhaust gas recirculation (EGR) was tested at steady-state, part-load conditions for four engine speeds. Turbocharging, in addition to increasing the engines power output, maintained exhaust emission levels while improving fuel economy. When comparing a turbocharged engine to a larger displacement naturally aspirated engine of equal power output, the emissions were relatively unchaged both with and without EGR. However, turbocharging provided an average of 20% improvement in fuel economy both with and without EGR. Turbocharging without EGR increased the hydrocarbon and carbon monoxide emissions and decreased oxides of nitrogen emissions compared to nonturbocharged engines. With the addition of EGR, turbocharging increased all three emissions. When comparing turbocharged and nonturbocharged engines of equal displacement on the heavy-duty 13-mode dynamometer cycle, turbocharging reduced CO emissions and increased HC and NOx emissions both with and without EGR. (Author abstract modified)

35701 **APTIC NO. 59265**

Seizinger, D. E. and B. Dimitriades

OXYGENATES IN AUTOMOTIVE EXHAUSTS. EFFECT OF AN OXIDATION CATALYST. *Bureau of Mines, Bartlesville, Okla., Bartlesville Energy Research Center, Report of Investigations 7837, 23p., 1973. 7 refs.*

Analytical methods for oxygenates in exhaust gases were studied, and emissions of these compounds from automotive engines were measured with and without an oxidation catalyst in the exhaust system. Hydrocarbons, simple mixtures of hydrocarbons, and a single gasoline were used as fuels. With the more complex gasoline, successful analysis was possible only with exhaust from the catalytic system which preferentially converted and thus removed interfering hydrocarbon species. However, an estimate of the oxygenate yield from gasoline used in a noncatalytic system can be synthesized from data obtained with simple fuels. Such synthesized data were used for comparison of noncatalytic with catalytic systems. Compared with those of previous studies, results of this work indicate that the action of the catalyst introduced no new oxygenates and reduced both the carbonyl and the total oxygenates. The compositional character and class distribution of oxygenates in exhaust from catalytic systems may differ significantly from the compositon and distribution for oxygenates not subjected to catalytic conversion. The findings also support previous estimates that noncarbonyls may constitute a significant fraction of exhaust oxygenates and may warrant attention in procedures for measurement of the oxygenates. (Author abstract modified)

35702 **APTIC NO. 59134**

Shabad, L. M., K. Vettig, and A. Ya. Khesina

POSSIBLE WAYS TO PREVENT THE EFFECT OF CARCINOGENIC SUBSTANCES ON MAN. *(O vozmozhnosti profilaktiki vliyaniya na cheloveka kantserogennykh veshchestv). Text in Russian. Kazan. Med. Zh., no. 5:92-93, 1973.*

Possible ways to abate emissions of carcinogenic polycyclic aromatic hydrocarbons from their chief sources, i.e., domestic heating, industries, and motor vehicles, are outlined. Obsolete, individual domestic heating should be abandoned since flue gases and soot contain considerable amounts of carcinogenic hydrocarbons due to incomplete combustion. The benzo(a)pyrene concentration in soot was determined to be about 100 micrograms/g. Coking and petroleum processing plants constitute another major source of carcinogenic hydrocarbon emissions. Soot emissions can be abated very effectively by means of filters. The use of filters in a carbon black production plant was determined to have a soot separation efficiency of 99%. Changes in the fuel composition, the use of certain additives to gasoline, and improvements in the combustion conditions are suitable for reducing the emission of polycyclic aromatic carcinogens from motor vehicle engines. The radical solution in this respect will be, however, a switch to natural gas and electricity-powered vehicles, especially in city traffic. Emissions of carcinogens from aircraft can be abated by the addition to the fuel of magnesium or by the use of non-aromatic fuel by 30% and 60%, respectively. Potentiation of the carcinogenic effect of benzo(a)pyrene by sulfur dioxide, nitrogen oxides, and acrolein, possibly through facilitating the lung retention of carcinogen-loaded solid particles, was observed. Complex experiments show that the maximum allowable in-the-air concentration of benzo(a)pyrene should be set at 0.01 micrograms/100 cu m in the atmosphere, and at 15 micrograms/100 cu m in workplace air.

35703 **APTIC NO. 58744**

Shamah, E. and T. O. Wagner

FUEL QUALITY OR ENGINE DESIGN: WHICH CONTROLS DIESEL EMISSIONS? *Preprint, Society of Automotive Engineers, New York, 23p., 1973. 8 refs. (Presented at the Society of Automotive Engineers International Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1973.)*

In most diesel engines, changing from a high-density fuel to a low-density fuel such as kerosene will reduce exhaust smoke and emissions of carbon monoxide. Part of the change is due to reduction in the quantity of fuel injected, and part is apparently due to the greater soot-forming tendency of aromatic compounds. If the engine is adjusted to yield the same power on all fuels, differences among fuels are relatively small. Changing fuel, even by drastic changes in boiling range and hydrocarbon composition, has very little effect on emissions of hydrocarbons in the four-stroke engines tested, but the lighter fuels, which were more volatile, caused higher hydrocarbons in the two-cycle engine used in these tests. Changing fuel had no significant effect in nitric oxide in any of the engines used. While the differences in smoke, HC, and CO were large enough to be measured in the laboratory, they are much smaller than differences in emissions among engines using the same fuel. Although certain emissions can be reduced slightly in some engines by proper choice of fuel, changing fuel quality is not overall an effective way to control emissions from diesel engines in service today. (Author conclusions)

35704 **APTIC NO. 58590**

Shimada, Isamu, Shigeru Yanagihara, Fumitake Chisaka, and Keizo Saito

PHOTOCHEMICAL REACTION IN HC-NOX-SO2 SYSTEM. *(Tanka suiso-chisso sankabutsu-aryusan gasukei no kokagaku hanno). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):561, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 284.)*

To examine interference elimination methods for oxidants and sulfur dioxide pollutants, smog chamber experiments were conducted. In a 11 cu m smog chamber, using ozone and SO2, the measurement of oxidants was taken without using a scrubber to see the effects of SO2. The effects of ferric sulfide and hydroquinone were examined for elimination of oxidants for SO2 concentration. The rate of oxidant reduction was 0.95 times (SO2 concentration)-0.04 ppm in SO2 concentration of 0-0.050 ppm. For SO2 elimination, hydroquinone was found effective. The effects of various variables are presented in graphs.

35705 **APTIC NO. 58523**

Shirasawa, Tadao, Zenichi Kawase, Ichiro Muraoka, and Kazuko Mizukami

AIR POLLUTION PRODUCED BY CUPOLA FURNACES (I), SURVEY ON EMISSION SOURCES. *(Kyupora ni yoru taiki osen ni tsuite (daiippo), hasseigen chosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):358, 1973. (Presented at Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

There are 93 electric furnaces and 418 cupolas in Kawaguchi, and dusts from these sources have long been targets for the citizens complaints. The dust elimination systems used by these cupolas were investigated and metal compositions and particle size distributions of dusts were investigated. The dusts were measured by the JIS method, particles above 44 micron were examined by Ro-Tap Sift, and smaller ones by pipette, and metals were analyzed by direct atomic absorption spectrophotometry. A total of 23 investigations were conducted between April 1972 and June 1973. At present, those cupolas utilizing a single dry centrifugal collector or simple scrubber are not producing satisfactory results; a combined use of dust collectors with water film or water layer passing methods are recommended. In many cases, the trapped dust by air-liquid contact are emitted in the form of dust-containing mists; therefore, the air-liquid separation system must be improved. Most cupolas in Kawaguchi are 1.5-2 ton/hr capacity and emit 5000 cu m/hr of emission gases. These treated by a single scrubber or dust collector emits an average of 6.5 kg/hr of dusts, 9.72 kg/hr of iron, 0.68 kg/hr of manganese.

35706 **APTIC NO. 58787**

Sies, W.

LOCATION FACTORS AT THE ERECTION OF LARGE INDUSTRIAL PROJECTS. THE DEMANDS FOR ENVIRONMENTAL PROTECTION BECOME AN EVER LARGER BURDEN. *(Raumordnungsfaktoren bei der Errichtung industrieller Grossprojekte. Umweltschutzforderungen werden immer belastender). Text in German. Metall, 27)12):1223-1228, 1973.*

The location factors influencing the economical operation of a large zinc electrolysis plant are discussed with special regard to the demands of environmental protection. Such plants should be located close to the place of consumption, to a power plant, to a water body and within the reaches of qualified personnel. This means that they are preferably located in industrial centers, which collides with the demands of environmental protection. However, over a period of three years, the zinc electrolysis plant in Datteln in the Ruhr Valley, for instance, solved all its environmental pollution problems. Over the roasting station, a building was erected. All supply paths and storage rooms for raw material were enclosed. An aerosol scrubber was installed in the leaching plant. A high-capacity scrubber was installed for the zinc melting furnaces with adjoining water purification. A network of 34 measuring stations surrounds the plant monitoring the emissions.

35707 **APTIC NO. 58536**

Soltau, J. P. and K. B. Senior

PETROL INJECTION CONTROL FOR LOW EXHAUST EMISSIONS. *Lucas Eng. Rev., 6(2):26-35, Nov. 1973.*

A fuel injection system is proposed to meet present emission standards for carbon monoxide, hydrocarbons, and nitrogen oxides. The best system possible with modern technology is a system using, as main control parameters, throttle angle and engine speed. The combination will give a completely unique control, but will be correct only as long as atmospheric and engine conditions are similar to those pertaining during the original engine test and establishment of the control surface. Corrections must be made for any deviation from the test conditions, and although this can be done accurately, it may involve more complication than the original control if the tolerance bands are narrow. There is only one way to build such a control system in a small enough package and at an acceptable cost, and that is where the main computer is electrical. Electronic techniques now enable the whole system to be digital in concept and accurate to any required degree. Integrated circuits provide a control unit of small physical dimensions and will enable the system to be manufactured cheaply in large quantities. The electromechanical constant pressure nozzle provides the simplest and most reliable hydraulic arrangement. An electronic computer could also control, via a suitable interface, a piston pump or a shuttle-type pump.

35708 **APTIC NO. 59108**

Soltis, Charles W.

ELECTROSTATIC AIR FILTER. *(Assignee not given.) U. S. Pat. 3,763,633. 6p., Oct. 9, 1973. 8 refs. (Appl. Feb. 9, 1971, 15 claims).*

An air cleaner consisting of a filter assembly, an electrical power pack, and interconnecting high-voltage transmission means is described. The filter assembly is constructed of a filter unit having a prefilter and two layers of a dielectric filter media between which is sandwiched a positively charged grid. The filter assembly further includes a pair of negatively charged plates between which the filter unit is placed, and a header assembly molded of a rigid plastic which is also provided with the male high-voltage receptacle and high-voltage contacts to the anode grid. The filter unit is only one-inch thick and can fit into the same space as existing air-conditioning filters. No duct modifications are required for installation. A disposable synthetic filber collector is employed which is very easily serviced, and the filter is of significantly reduced cost. It operates at substantial reduction of ozone emission compared to the commercially available electronic air cleaners. (Author abstract modified)

35709 **APTIC NO. 59157**

Spinart, J.

THE ENERGY POLITICS PURSUED BY THE ELECTRICITE DE FRANCE, AND PERSPECTIVES. *(Politique energitique d Electricite de France et perspectives). Text in French. Tech. Moderne, 65(10):19-22, Oct. 1973.*

Actual plans and perspectives in energy production in France are outlined. All thermal power plants being planned or under construction will use fuel oil, with only a few designed for natural gas. However, power generation will bedincreasingly switches from thermal to nuclear power plants. The sulfur dioxide and sulfur trioxide emissions from thermal power plants will be abated with high stacks which give better dilution and higher speed of discharge. In particular, SO3 emissions will be reduced by the injection of ammonia into the combustion gas. All thermal power plants are stocking fuel oil with sulfur contents below 1% which is intended for use during start-up in unfavorable meteorological conditions. Further studies on the desulfurization of fuels flue gases will be necessary.

35710 **APTIC NO. 59079**

Stockman, Richard F.

ASH PROCESSING SYSTEM. *(Air Preheater Co. Inc., Wellsville, N. Y.) U. S. Pat. 3,765,346. 4p., Oct. 16, 1973. 5 refs. (Appl. March 30, 1972, 5 claims).*

A pyrolytic system for the conversion of waste material into its basic components is presented. The ash resulting from the pyrolysis of organic waste material together with glass bottles, metal cans, foil, and other noncombustible residue is compressed and baled before being introduced into a high temperature slagging chamber. In the slagging chamber, the baled refuse is subjected to heat sufficient to reduce it into a molten slag and its molten metallic components, while the gaseous products of combustion are directed downward and over the surface of the hot molten residue to effect complete oxidation of their combustible components. Although previous slagging incinerators have been developed, they did not process the ash and other noncombustible waste. By processing them, this invention removes waste and reduces air pollution. (Author abstract modified)

35711 **APTIC NO. 58493**

Sugioka, Masatoshi and Kazuo Aomura

STUDIES OF CATALYTIC CRACKING OF ORGANIC SULFUR COMPOUNDS OVER SOLID ACID CATALYSTS (PART 8). THE MECHANISM OF CRACKING REACTION OF ALIPHATIC MERCAPTANS AND ALIPHATIC SULFIDES ON SILICA-ALUMINA CATALYST. *Bull. Japan Petrol. Inst. 15(2): 136-141, Nov. 1973. 15 refs.*

The catalytic cracking of aliphatic mercaptans and sulfides on the silica alumina catalyst were investigated by use of a pulse reactor. The cracking reactivities of aliphatic mercaptans and sulfides increase in the following order: C2H5SH is less than n-C3H7SH is less than n-C4H9SH is less than i-C3H7SH is less than sec-C4H9SH; (CH3)2S is less than (C2H5)2S is less than (n-C3H7)2S is less than (n-C4H9)2S. This order is also consistent with the order of the stability of alkyl carbonium ions produced from the corresponding alkyl groups. The linear relationship was observed between the logarithms of the apparent rate constants of the cracking reaction of aliphatic mercaptans and sulfides and the enthalpy change of formation of carbonium ion from the corresponding paraffins. From these results, a hypothesis was proposed that the catalytic cracking of aliphatic mercaptans and sulfides on the silica-alumina catalyst takes place with the carbonium ion mechanism. (Author abstract modified)

35712 **APTIC NO. 59093**

Syrota, J.

INTRODUCTION. SULFUR OXIDES AND AIR POLLUTION. *(Introduction. Les oxydes de soufre et la pollution atmospherique). Text in French. Ann. Mines (Paris), 1973:10-14, Nov.-Dec. 1973.*

General problems of air pollution by sulfur dioxide in Europe and in France, possibilities of the abatement of SO2 emissions, and ground level concentrations of SO2 in France are outlined. While the SO2 concentrations encountered in practice, being below or around the maximum allowable concentration of 150 micrograms/cu m, do not involve health hazards, and SO2 contributes to the dispersion of photochemical smog.

Energetic measures will be required for the abatement of SO_2 emissions due to their steady increase during the past decades. Full-scale solutions for the desulfurization of domestic and heavy fuel oils and of flue gases are available. In France, the fuel oil sulfur content will be lowered from the present 0.7% to 0.3% in 1978, and additional protection zones in which the use of low-sulfur fuels will be required will be determined. In addition, the use of high-sulfur fuels will be prohibited in industrial plants and power plants in highly polluted areas whenever the SO_2 concentration exceeds certain limits. The use of high stacks, improved heat insulation of buildings, the creation of green spaces, and the separation of residential from industrial areas will also contribute to the abatement of the SO_2 concentrations.

35713 **APTIC NO. 59146**

Tjoa, Giok H. and Karl H. Kilgren

METHOD OF REMOVING GASEOUS SULFIDES FROM GASEOUS MIXTURES. *(Chevron Research Co., San Francisco, Calif.) U. S. Pat. 3,767,766. 12p., Oct. 23, 1973. 5 refs. (Appl. Feb. 22, 1971, 29 claims).*

A process is described for selectively removing hydrogen sulfide and other sulfides from fluids such as natural gas. The fluids are contacted with substituted aromatic nitrile having an electron-attracting substituent on the aromatic ring at least as strong as halogen (e.g., isophthalonitrile) and an alkali hydrosulfide in a substantially hydroxyl-free solvent such as N-methyl-2-pyrrolidone. Preferably, in the process an admixture of H_2S and carbon dioxide in natural gas is contacted with the substituted aromatic nitrile containing contacting solution to react the H_2S with the nitrile; the CO_2 and/or like hydrocarbons are rejected from the contacting solution by mild heating and/or pressure reduction, and the H_2S is regenerated by heating the remaining solution. In this invention, problems of various other H_2S-removal processes are eliminated or substantially reduced. A major advantage of the present process is that no matter what the initial concentration of H_2S is, the process can remove essentially all the H_2S present. The process can be conducted at relatively low pressures, and the contacting can be carried out at relatively high temperatures. The nonaqueous contacting solutions are relatively noncorrosive, and the enriched contacting solution is readily regenerated by heating. (Author abstract modified)

35714 **APTIC NO. 58894**

Touz, Jean

INCINERATION OF DOMESTIC REFUSE IN ASSOCIATION WITH WASTE HEAT RECOVERY IN THE PARIS REGION. *(L incineration des ordures menageres avec recuperation de chaleur dans la region parisienne). Text in French. Rev. Gen. Thermique (Paris), 12(142):1045-1052. Oct. 1973.*

The combination of domestic waste incineration with waste heat recovery for electricity generation is described using the example of the Ivry incinerator plant near Paris. The incinerator plant has a yearly capacity in excess of 600,000 tons. The calorific value of the wastes to be incinerated ranges from 1250 to 2000 kcal/kg. The flue gases leaving the economizers at 210 C temperature are dedusted in a two-chamber electrostatic precipitator with an efficiency of 99% to provide for a residual dust concentration of 0.06 g/cu m against a maximum allowable concentration of 0.15 g/cu m. The incinerator plant generates 255 tons of steam hourly at 470 C and under 75 bar pressure for the generation of 64 Mw electricity for the municipal mains.

35715 **APTIC NO. 58501**

Tsugeno, Hajimu, Takashi Mashita, Hiromasa Kouda, Hayami Ito, Noriaki Takahashi, and Syuhei Tatsumi

DEVELOPMENT OF MG-GYPSUM METHOD FLUE GAS DESULFURIZATION PLANT. *(Maguneshumu sekkoho haien datsuryu puranto no kaihatsu kenkyu). Text in Japanese. Kawasaki Giho (Kawasaki Tech. Rev.), no. 51:40-45, Oct. 1973.*

A new desulfurization process for flue gas was developed by the Kawasaki Heavy Industries using magnesium and producing gypsum as a by-product. The characteristics of the methods are: higher efficiency for desulfurization than calcium hydroxide, less scaling in the absorption tower because of the double decomposition gypsum and the operation in acidic pH area, the greater oxidation speed in the oxidation tower with the presence of magnesium sulfide, an almost complete recovery of magnesium compounds, simplicity, small sulfuric acid consumption, and high purity of recovered gypsum. The process of stack gas desulfurization includes: gas cooling and dust collection, dust separation, sulfur dioxide absorption, return of water and $MgSO_4$ mixture to the absorption tower by double decomposition, mist separation of desulfurized gas, oxidation, gypsum separation, and return of $MgSO_4$ by double decomposition with H_2O and $Ca(OH)_2$.

35716 **APTIC NO. 58818**

Tsuritani, Taiichi

APPARATUSES USED FOR THE DISPOSAL OF DISCHARGED GASES 2. *(Haigasu shori gijutsu 2). Text in Japanese. Sefuti Daijesuto (Safety Dig.), 19(10):384-401, Oct. 1973. 19 refs.*

Control methods for stack gases are reviewed. The nature and concentration of the stack gas influence the choice of method. Absorption methods usually incorporate a scrubbing device, such as a packed tower, spray tower, or bubble tower. Adsorption methods utilize silica gel, alumina gel, or molecular sieves most often. Adsorption methods are most effective for sulfur dioxide, organic solvents, and odors. Combustion methods utilize flame afterburners which burn with various types of gas or oil. Catalytic oxidation is done with a catalytic afterburner using catalysts such as platinum, palladium, or rhodium. Data on interfering agents and maintenance of these methods are given.

35717 **APTIC NO. 59078**

Vacatko, Zbynek

ELECTROSTATIC PRECIPITATORS. *(Elektricke odlucovace). Text in Czech. Zdravot. Tech. Vzduchotech., 16(5):269-274, 1973. 2 refs.*

The history of electrostatic precipitator use in Czechoslovakia is discussed. Precipitator types are described. The construction details of a horizontal dry precipitator and its function are described. The uses of precipitators, basic inlet gas parameters, and precipitator efficiencies are discussed.

35718 **APTIC NO. 58964**

Viland, Clare Kenneth

METHOD OF PREVENTING LOSS OF HYDROCARBONS TO ATMOSPHERE. *(Assignee not given.) U. S. Pat. 3,763,901. 13p., Oct. 9, 1973. 6 refs. (Appl. Jan. 25, 1971, 17 claims).*

A self-contained vapor recovery system for gasoline service stations and for similar applications is described. Displaced hydrocarbon gases are collected at the point of entry when a vehicle s fuel tank is being filled, or when the service station s main storage tanks are receiving a fresh loading of gasoline. These vapors are collected under controlled pressure conditions and passed through a refrigerated condensation or absorption zone, and the liquid is returned to the service station s storage tank, preferably below the liquid level there. The essentially hydrocarbon-free gas, now mainly air, is discharged into the atmosphere. The invention not only helps conserve a valuable natural resource, the petroleum from which the gasoline is made, but also alleviates air pollution and smog formation. (Author abstract)

35719 **APTIC NO. 58954**

Villalobos, Richard

APPARATUS FOR ANALYZING AMBIENT AIR. *(Beckman Instruments, Inc., Fullerton, Calif.) U. S. Pat. 3,762,878. 8p., Oct. 2, 1973. 6 refs. (Appl. April 19, 1971, 13 claims).*

An analytical apparatus and method for measuring pollutants in ambient air and specifically for measurement of methane, ethylene, acetylene, carbon monoxide, carbon dioxide, and total hydrocarbons in ambient air is described. The apparatus employs a hydrogen flame ionization detector and the gases employed in the analysis instrument are only those gases required for combustion in the flame detector. Air is employed as the carrier gas in a total HC analysis line to the detector. The carrier air stream is passed through an oxidizer catalyst to completely oxidize the HCs in the carrier air to provide a true zero-HC reference level in the ionization detector against which the total HC content of the ambient sample is compared. Hydrogen is employed as the carrier gas in a gas chromatograph analyzer for separating the HCs and CO in an air sample. The H_2 carrier gas simultaneously provides the H_2 requirements of a methanator in the chromatograph line, which converts CO and CO_2 into CH_4 so that a relative measurement may be made in the ionization detector for these constituents, as well as the H_2 gas requirements of the detector. (Author abstract)

35720 **APTIC NO. 59151**

Voelskow, Peter

CLOSED CIRCUIT MULTI-STAGE AIR CLASSIFIER. *(G. Siempelkemp and Co., Krefeld (West Germany)) U. S. Pat. 3,767,045. 9p., Oct. 23, 1973. 11 refs. (Appl. March 17, 1971, 12 claims).*

A closed-circuit air classifier for comminuted and particulate materials, especially wood fibers, sawdust, pulverized-wood particles, and the like is described. It comprises a coarse air classifier and a fine classifier, each of which is provided with respective fan or whizzer blades for suspending or entraining the particles with respective air streams. The inlet of the coarse air classifier is connected to the outlet of the fine air classifier and is provided with a pneumatic gate through which the material to be classified is introduced into the system. The outlet of the coarse of the classifier is connected to the inlet of the fine classifier. The classifier can be used to collect heavy and relatively light particles of comminuted wood for the preparation of pressed board. The classifier overcomes disadvantages of prior gravitational classifiers by operating without atmospheric contamination, by having low operating and capital costs, and by being an efficient method of separating the particulate material by size. (Author abstract modified)

35721 **APTIC NO. 59328**

Wagner, Manfred

STUDIES ON A PROCESS MODEL OF A REACTION SYSTEM FOR SO_2 OXIDATION BY MEANS OF DIGITAL SIMULATION. *(Untersuchungen am Prozessmodell eines Reaktionssystems zur SO2-Oxydation mittels digitaler Simulation). Text in German. Preprint, VEB KIB Chemie, Stammbetrieb des VEB Chemieanlagenbau- und Montagekombinat Leipzig, 16p., 1973. 3 refs. (Presented at the Verfahrenstechnischen Jahrestagung, Halle, East Germany, June 27-28, 1973.)*

A process model for a reaction system for sulfur dioxide oxidation is described. The model permits the study of contact systems which are either in the planning stage or already in operation. The basis of the model is the partial differential equations for the energy and mass balance in heat exchangers and reactor zones. It has been established for adiabatic process conduction with negligible heat loss in the reactor. The heat storage of the contact mass is taken into consideration. The reaction is assumed to have a temperature dependent reaction speed and SO_3 equilibrium concentration. A gas flow with uniform speed across the whole cross section is assumed. In the heat exchanger the heat losses are neglected. The average temperature difference is used as an approximation for the logarithmic temperature difference. The dependence of the coefficient of heat transmission of both flow velocities is taken into consideration. The program is written in Fortran 63 for the computer CDC 1604.

35722 **APTIC NO. 59119**

Watanabe, Takeharu, Yasuo Iida, Koichi Inoue, Kunio Yoshizumi, and Toshio Odaira

EXHAUST GAS CONTROLLING DEVICES. *(Jidosha haiki gasu gensho sochi ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):330, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 75.)*

Various devices designed to reduce toxic components in automotive exhaust gases were tested on an actual car. The devices were attached to a domestic 1600 cc gasoline car, 4-cycle, 4-cylinder, water-cool type, with a mileage of 20,000 km. The devices were: a supplementary air flow type which enhances the rate of complete combustion by approximating the air-fuel ratio to the theoretical level; a similar device which passes the air through a methanol solution to give it methanol steam; a device which supplies air when operating at no load or minus load, and water when operating at a high load; a modified engine with improved suction manifold with an added spacer to the ignition plug; and a device which stabilizes the secondary electric pressure for improving combustion. The best results were obtained by the fourth device, which reduced carbon monoxide by 29%, hydrocarbons by 26%, and nitric oxide by 47%. The last device was very ineffective, and the others reduced some elements and increased some others.

35723 **APTIC NO. 58748**

Wyczalek, Floyd A., Thomas R. Leonard, and Donald W. Peterson

GENERAL MOTORS EXPERIMENTAL SAFETY VEHICLE--POWERTRAIN AND FUEL SYSTEM. *Preprint, Society of Automotive Engineers, New York, 9p., 1973. (Presented at the Society of Automotive Engineers International Automotive Engineering Congress and Exposition, Detroit, Mich., Jan. 8-12, 1973.)*

The basic emission controls consist of an air injection reactor, exhaust gas recirculation, transmission-controlled spark advance, preheated intake, air unitized ignition system, and positive crankcase ventilation. The power train is fitted with a left-hand exhaust system with crossover from right to left. A left-hand exhaust and a right-hand fuel tank filler pipe were selected. The fuel system includes the fuel line, vapor return line, and fuel gage sending unit mounted together on top of the fuel tank. The fuel, vapor return, and emission pipes are routed in a unique standpipe arrangement to meet the contract specifications of zero leakage in a vehicle rollover. The vapor emission line extends out of the top of the tank and runs forward to a conventional charcoal canister. This emission line makes several loops in the tank area and extend beyond all extreme surfaces, giving it the action of a standpipe in all vehicle attitudes. Emissions of hydrocarbons, carbon monoxide, and nitrogen oxides are considerably below Federal exhaust emission standards.

35724 **APTIC NO. 59478**

Bureau of Mines, Washington, D. C.

TECHNOLOGIC AND RELATED TRENDS IN THE MINERAL INDUSTRIES, 1972. *Bureau of Mines Information Circ., no. 8603:1-44, 1973. 7 refs.*

GPO

Recent trends and developments in the minerals industry are outlined. Topics covered include: exploration and extraction trends; liquid and gaseous fuel production; productivity; metallurgical trends; recycling, waste treatment, and environmental control; energy product utilization (coal gasification, alternative fuels); health and safety; and legislative actions. Coal preparation is reviewed under metallurgical trends, and mention is made of the trend in dust collection facilities at coal transfer points for compliance with Federal mine safety laws. Air pollution control developments in metallurgy, as for example, the installation of scrubbers on quenching towers and the equipping of coke oven batteries with preheating and smokeless pipeline charging equipment, are also reviewed.

35725 **APTIC NO. 58698**

North Atlantic Treaty Organization, Committee on the Challenges of Modern Society, Expert Panel for Air Pollution Control Technology and Research Triangle Inst., Research Triangle Park, N. C.

AIR POLLUTION. CONTROL TECHNIQUES FOR CARBON MONOXIDE EMISSIONS FROM STATIONARY SOURCES. N. 18. (FINAL REPORT). *112p., Oct. 1973. 117 refs.*

GPO

A compendium of information on methods for the control of carbon monoxide emissions has been assembled based on the Environmental Protection Agency s Control Techniques for Carbon Monoxide Emissions. Industrial process sources considered include: the iron and steel industry, petroleum refineries, the chemical industry, carbon black manufacture, the paper and pulp industry, and other miscellaneous sources including waste incineration. Control techniques described include: source relocation or shutdown, energy substitution or conservation, good practice, automatic burner control systems, afterburners, waste-heat boilers, mechanical sealing, hoods, flares, and catalytic oxidation. Emission factors are given for carbon monoxide sources.

35726 **APTIC NO. 58982**

Coignard, P.

DESULFURIZATION. THE STANDPOINT OF THE PETROLEUM INDUSTRY. *(La desulfuration. Le point de vue des petroliers). Text in French. Ann. Mines (Paris), Nov.-Dec. 1973:55-60, 1973.*

General technical and economic problems of desulfurization of fuel oils and of flue gases are discussed. Since the supply of low-sulfur petroleum is limited, fuel gasification, fuel desulfurization, or flue gas desulfurization will be increasingly required. In the gasification process, adopted mostly by power plants, the fuel is gasified by partial oxidation with air, after which the gas obtained is desulfurized. This combination steam turbine-gas turbine cycle has been developed by Shell. Flue gas desulfurization is suitable for the removal of 90% of the total sulfur from the flue gases. Fuel desulfurization can reduce the fuel sulfur content to 1%, and, in the near future, to 0.5%. The Flexicoking process, proposed by Esso, provides for coking of the vacuum residue, after which the coke is gasified, and the distillates can be desulfurized to 0.5%.

35727 **APTIC NO. 59178**

American Petroleum Inst., Washington, D. C., Committee on Refinery Environmental Control

HYDROCARBON EMISSIONS FROM REFINERIES. *Pub-928, 64p., July 1973. 13 refs.*

Methods for control of hydrocarbon emissions from refineries and their cost-effectiveness are reviewed based upon actual installations. Primary sedimentation devices are a potentially high source of loss as are gasoline filling operations at the loading rack and catalyst regeneration processes. Floating covers for primary sedimentation devices and incineration of noncondensable gases from vacuum distillation appear to be the most effective controls from a cost-effectiveness standpoint. Floating roof tanks, vapor recovery systems, fixed covers for oil-water separators, and incineration of odors from asphalt blowing are moderately cost effective. Recovery of vapors from a post-gravity oil-water separation device and their disposal by incineration, carbon monoxide boilers, plume burners, and in most cases mechanical seals, show the lowest benefits in relation to cost.

35728 **APTIC NO. 59459**

Singmaster and Breyer, New York

AIR POLLUTION CONTROL IN THE PRIMARY ALUMINUM INDUSTRY. VOLUME II OF II APPENDICES. *National Air Pollution Control Administration Contract CPA 70-21, EPA-450/3-73-004b, 243p., July 23, 1973. 21 refs.*

NTIS: PB 224283/AS

The appendices of a detailed report on air pollution control in the primary aluminum industry are presented. They include: data acquisition questionnaire, particle size/weight distribution, fractional removal efficiency curves, sampling and analytical techniques, method 13-determination of total fluoride emissions, Environmental Protection Agency source sampling, emission flow diagrams, removal equipment purchase costs, and sample calculation of industry control improvement costs.

1972

35729 **APTIC NO. 59447**

Blankenship, Charles P. and Robert R. Hibbard

STATUS REPORT ON THE NASA-EPA AUTOMOTIVE THERMAL REACTOR TECHNOLOGY PROGRAM. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA-TM-X-68010, 40p., Jan. 1972. 14 refs.*

NTIS: N72-17844

The current status of the National Aeronautics and Space Administration-Environmental Protection Agency automotive thermal reactor technology program is summarized. Engine dynamometer tests of candidate metals and coatings indicated that two ferritic iron alloys (GE 1541 and Armco 18-SR) and a nickel-base alloy (inconel 601) offer promise for reactor use; none of the coatings evaluated warrant further consideration. Developmental studies on a ceramic thermal reactor appeared promising based on initial vehicle road tests. A chemical kinetic study has shown that gas temperatures of at least 900-1000 K are required for the effective clean-up of carbon monoxide and hydrocarbons but that high temperatures require shorter combustion times and thus may permit smaller reactors. (Author abstract modified)

35730 **APTIC NO. 58689**

Bogdan, L., H. T. McAdams, and D. J. Schuring

AN EVALUATION OF THE STRATIFIED CHARGE ENGINE (SCE) CONCEPT. *Cornell Aeronautical Lab., Inc., Buffalo, N. Y., Office of Air and Water Programs Contract 68-04-0040, APTD-1356, 209p., Jan. 1972. 22 refs.*

NTIS: PB 226738/AS

Preliminary studies aimed at establishing a rational basis for the evaluation of the stratified charge engine as a low emission power plant for light duty vehicle applications are described. The salient engineering features of the stratified charge engine are included together with statistical analyses of the limited exhaust emissions data that are available on vehicles equipped with hand built experimental engines. For the purposes of augmenting this limited data base and for purposes of comparison and analogy, statistical analyses of pertinent emissions data obtained for conventional type automobile engines are also presented. To provide essential but missing data, the rationale for and the details for an experiment design for presently available engine/vehicle units are presented. New hardware requirements are also identified. (Author abstract modified)

35731 **APTIC NO. 58742**

Bond, William D.

QUICK-HEAT INTAKE MANIFOLDS FOR REDUCING COLD ENGINE EMISSIONS. *Preprint, Society of Automotive Engineers, New York, 19p., 1972. 4 refs. (Presented at the Society of Automotive Engineers National Fuels and Lubricants Meeting, Tulsa, Okla., Oct. 31-Nov. 2, 1972.)*

Some design parameters and development experience on quick-heat intake manifolds for evaporating fuel are presented. Basic information on early fuel evaporation systems is presented. These can achieve good fuel evaporation soon after a cold start. Used in conjunction with a fast-opening choke, such a quick-heat intake manifold helps reduce carbon monoxide emissions. This is especially effective on cars with catalytic converters, since CO caused by cold enrichment is produced at a time when the catalyst is not yet hot and effective. The sensitivity of one design of quick-heat intake manifold to fuel volatility characteristics is included. A variety of ways to correlate driveability with the ASTM distillation characteristics of the fuel are evaluated. (Author abstract)

35732 **APTIC NO. 58757**

Calvert, W. R.

CATALYSTS FOR AN AIR DECONTAMINATING UNIT. *Naval Ship Research and Development Center, Annapolis, Md., Annapolis Lab., Proj. F 35 433, Task Area SF 35 433 022, Program Element 62512N, Work Unit 1-2852-101, Rept. 28-170, 18p., Oct. 1972. 3 refs.*

NTIS, DDC: AD 749080

Several catalysts were studied as part of an air decontaminating unit. Catalysts are necessary when the low-boiling fuel gases must be oxidized to air separation of these contaminants from oxygen and nitrogen. Of the eight evaluated catalysts, one may be best for a given fuel gas contaminant but not for others. Methane, the most difficult fuel gas to oxidize, may be oxidized at 950 F rather than at 1200 F. The fuel gases also included hydrogen and carbo monoxide. Contaminants included H_2, CO, CH_4, and C_3H_8. (Author abstract modified)

35733 **APTIC NO. 59239**

Cordner, M. A. and D. H. Grimm

TRANSMISSION STUDY FOR TURBINE AND RANKINE CYCLE ENGINES. *Sunstrand Corp., Rockford, Ill., Sunstrand Aviation, Office of Air and Water Programs Contract 68-04-0034, APTD-1558, AER 657, 186p., Dec. 1972. 7 refs.*

The technical and economic feasibility of existing and potential types of transmissions most suitable for the gas turbine and Rankine cycle engines was investigated. Application of the engine/transmission was to a full-size family car. The study was accomplished through a two phase, multi-task programs which included: evaluation of transmission types through a feasibility study and ultimate selection of a transmission types; evaluation of the selected transmission type through design calculations and layouts, performance analysis, control system analysis, and cost analysis. A number of different types of transmission were initially evaluated including conventional multi-shift, hydrostatic, hydrokinetic, electric, belt/chain, hydromechanical, and traction types. (Author abstract modified)

35734 **APTIC NO. 59197**

Crawford, L. W., A. A. Mason, and J. M. Lents, Jr.

POLLUTANT PRODUCTION IN A SIMULATED TURBOJET AFTERBURNER. PART I. EXPERIMENTAL AND THEORETICAL STUDY. *Tennessee Univ. Space Inst., Tullahoma, Tenn., Air Force Contract F33615-71-C-1125, Proj. 3066, Task 306605, Rept. Afapl-TR-71-66 Part I, 145p., Feb. 1972. 21 refs.*

NTIS, DDC: AD 739176

An experimental and theoretical study was made of the history of the pollutants carbon monoxide, unburned hydrocarbons, and nitrogen oxides in a turboject afterburner. Experimental traverses at several axial stations were performed in a simulated afterburner in which exhaust from a J-47 combustor can, operated at medium power, was mixed with fuel spray. Experiments were conducted both in a nonbypass and a bypass configuration, secondary air being mixed with primary exhaust. The nonbypass tests were conducted at high combustor efficiency and yielded the following: 300 ppm CO, less tha 10 ppm HC, and 100 ppm NOx. Fuel distribution was nonuniform, and combustor efficiency was low in the bypass tests; concentrations obtained were: 10,000 ppm CO, 1000 ppm HC, and 100 ppm NOx. Theoretical analysis consisted of a computer program for reacting flow with turbulent mixing. The program was very slow, however, and therefore of limited usefulness in terms of cost and questionable results since it could not be checked against the experiment. Infrared measurements of nitric oxide in the combustion tunnel were attempted; and indications were obtained of NO at the 5.3 micron band, though quantitative measurements were not obtained. (Author abstract modified)

35735 **APTIC NO. 58807**

Csom, Gyula, Jozsef Halzl, Istvan Matrai, and Zoltan Vadas

GROUP 3. COMPLEX ENERGY UTILIZATION SYSTEMS AND FACILITIES IN MULTIPURPOSE PROCESSES. *(3. szekcio. Az energiz komplex hasznositasi rendszerei es berendezesei tobb celu foiyamatokban). Text in Hungarian. Energia Atomtech. (Budapest), 25(8-9):396-411, Aug.-Sept. 1972.*

Possibilities and actual processes for the complex utilization of thermal, hydraulic, and atomic energy are surveyed. Remote steam or hot-water heating, especially when combined with electricity generation, helps abate air pollution over residential areas. A special gas turbine closed system incorporates an adiabatic reactor for the partial oxidation of natural gas. The partially oxidized natural gas, leaving the gas turbine at 400 C, can be used in conventional power plants, increasing their efficiency to 41%, or in industrial furnaces. The low-pressure steam from thermal power plants can be efficiently used for the evaporative desalting of seawater. Following removal of nitrogen oxides, the high-pressure waste gases from the dilute nitric acid production process is used for driving expansion turbines for compressors. The waste heat of high-temperature, high-volume flue gases from iron and steel industrial processes is utilized in economizers.

35736 **APTIC NO. 59452**

Culpepper, M. M. and W. A. Wilvert

ENGINEER DESIGN TESTS OF DUST-CONTROL MATERIALS AND EMPLACEMENT EQUIPMENT. (FINAL REPORT). *Army Engineer Waterways Experiment Station, Vicksburg, Miss. and Army Mobility Equipment Research and Development Center, Fort Belvoir, Va., Army Material Command Proj. 1G664717DH01, Task 12, Task 13, Misc. Paper S-72-14, 47p., June 1972. 1 ref.*

NTIS, DDC: AD 745086

The engineer design tests of two dust-control materials, a polyvinyl acetate (PVA) water emulsion and a cationic asphalt neoprene emulsion (CANE), and two distributors, one pneumatic and one mechanical, that were used to apply the PVA and CANE, are described. Both distributors were used to apply the PVA and CANE with no reinforcing, with fiberglass scrim reinforcing, and with pre-chopped fiberglass reinforcing to sand and clay soils in the intermediate climate. The materials were allowed to cure for 4 hr and then subjected to the simulated airblast of a helicopter, an aircraft, and 1/4 and 2 and 1/2 ton vehicles. Only minor deficiencies in the PVA and CANE (instability in storage, excessive runoff, and tackiness after 4 hr curing time) were observed. The pneumatic distributor sprayed both materials with ease, but the mechanical distributor encountered difficulty in spraying CANE. Generally, the film-forming dust-control materials PVA and CANE were useful in preventing fugitive dust caused by the helicopter, aircraft, and truck airblasts. (Author summary modified)

35737 **APTIC NO. 59235**

Debrun, G.

PREVENTION OF AIR POLLUTION BY DUST IN THERMAL POWER PLANTS. *(Prevention de la pollution par les poussieres. Cas des centrales thermiques). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 14p. 11 refs. (May 3-5.)*

Problems of the abatement of air pollution, especially such caused by particulate matter, in thermal power plants are discussed. The steady reduction of the quantity of solid fuels, and a parallel increase in the amount of fuel oil, and of nuclear energy will result in a reduction of the fly ash emissions. The fly ash production from coal-firing power plants has declined from 1,357,000 tons in 1967 to 1,190,000 tons by 1970 due to the reduction of the amount of coal used from 11,700,000 tons to 10,000,000 tons. The average concentration of the fly ash in the flue gases lies at 10 g/N cu m. While hydraulic dust separators have been completely abandoned, mechanical ones, such as multicyclones, are used as a last stage in combination with electrostatic dust precipitators which latter reach efficiencies of 96.4-98.4% under practical conditions. While fuel oil-fired thermal power plants emit rather small quantities of fly ash (an average concentration of 0.05 g/N cu m may be assumed), they produce considerable amounts of sulfur dioxide, sulfur trioxide, and smoke. The rate of SO3 formation can be minimized by reducing the air excess coefficient to below 1%, which, however, results in increased generation of unburned hydrocarbons. The SO2 emissions can be effectively abated by the addition of ammonia, dolomite, or magnesia at expenditures usually smaller than 1 kg/ton of fuel oil. In France, mixed combustion equipment only are required to be equipped with dust separators, while no dust separator is prescribed for fuel oil-fired power plants. Installation of dust separators for oil-fired power plants, and increase of the discharge temperature of the flue gases are the basic tasks to be achieved in the emission abatement area in the future.

35738 **APTIC NO. 58863**

Dixon, Ronald R.

EFFECTS OF POLLUTION ABATEMENT PROCESSES ON STEAM GENERATION CONTROL. *Instrument Society of America, Pittsburgh, Pa., Proc. Instr. Soc. Am., Conf. Exhibit, Annu., 27th, New York, 1972, 7p. 12 refs. (Oct. 9-12, Paper 72-731.)*

The interaction of pollution abatement processes and steam generation control are discussed. Pollution emissions can be reduced by using either clean fuels or cleaning the flue gases after combustion. Besides gasification, which is used primarily for sulfur removal, changes in combustion techniques are being used to reduce nitrogen oxides. The most popular methods for NOx control are multiple stage combustion and fluidized bed boilers. The successful development of these processed requires the development of an automatic control system which will be capable of compensating for all the interactions that exist. The severity of the impact of the interaction is unknown. Identification of the impact and a formalized approach to control them is recommended to optimize all the demands and requirements placed on the generating units.

35739 **APTIC NO. 59029**

Evans, Chester E.

MANAGEMENT OF CATTLE FEEDLOTS AND WASTES IN THE GREAT PLAINS TO AVOID SOIL, WATER, AND AIR POLLUTION. *Soil Conservation Society of America, Earth Around Us, Proc. Soil Conserv. Soc. Am., Annu. Meet., 27th, Portland, Oreg., 1972, p. 74-80. 20 refs. (Aug. 6-9.)*

The potential pollutants of feed lot wastes include air, water, and soil pollutants. Water movement to feed lots, runoff from feedlots, rainfall-runoff relations to feed lots, rainfall amounts, rainfall intensity, effects on soil, water infiltration into feed lots soils, slopes of feed lots, movement of solids, design of feed lot surfaces, runoff effluent disposal on agricultural land, and flat feed lots are discussed. The major air pollutant from feedlots is ammonia which causes odors. Plants can absorb this ammonia from the atmosphere and use it for their growth. Manure can be mounded to be decomposed in compliance with acceptable air, water, and pollution standards. Manure can also be applied to agricultural lands. The costs, advantages, and disadvantages of various types of control methods are discussed.

35740 **APTIC NO. 59000**

Fukazawa, Shoichi, Tadashi Murayama, Kenichi Ito, and Shuichi Kajitani

A STUDY ON THE PROCEDURE AND REMOVAL OF AIR POLLUTANTS IN GASOLINE ENGINE. *JARI Tech. Memo. 10, p. 127-141, Dec. 1972. 1 ref.*

A cylinder running on gasoline via the suction system was operated with exhaust gas recirculation; with EGR combined with hydrogen, hydrogen peroxide, methyl alcohol added to the cylinder or with water, H2, H2O2, or methyl alcohol added to the cylinder. Carbon monoxide, carbon dioxide, nitric oxide, nitrogen dioxide, and hydrocarbons were examined. The influence of methanol addition on CO, HC, and NOx concentrations and the influence of ignition advance on fuel consumption on exhaust gas temperature, and on the excess air factor, were studied. Experiments of engine performance and exhaust emissions by varying the load were conducted. The influence of the ignition advance on CO, HC, and NOx concentrations; the relation between the methanol addition and the specific fuel consumption, the exhaust gas temperature, and the excess air factor; and the relation between the excess air factor and CO concentration under varied methanol addition, were studied. The CO, HC, and NOx emissions were compared to the rate of methanol under the conditions of 3000 rpm, 1/2, and full load. The CO and HC concentrations increased with EGR, but NOx decreased. This tendency was emphasized when menthanol was added. The emissions were studied when H2 was added to the incoming air. The distribution of the mixture in a multi-cylinder engine was studied. The weight of the incoming air and fuel in the cylinders two and three was greater by 10-30% than that in cylinders one and four under conditions of lighter load range and lower engine speeds of the four cylinder (firing order one, two, four, three) test engine. Even if the total air/fuel ratio is selected properly, it would be difficult to decrease the emission of air pollutants. The results of the indicator diagram analysis of the weight of fuel agreed well with the experimental results.

35741 **APTIC NO. 59042**

Garrett, J. W., R. P. Rhodes, A. G. Domal, and T. Osgerby

A DESIGN STUDY FOR TOXIC ROCKET EXHAUST GAS CLEANING. *ARO, Inc., Arnold Air Force Station, Tenn., Arnold Engineering Development Center, Air Force Contract F40600-73-C-0004, Proj. C077, Program Element 63101F, AEDC-TR-72-97, AFRPL-TR- 72-32, ARO-ETF-TR-72-38, 241p., Aug. 1972. 28 refs.*

NTIS, DDC: AD 747023

A survey of the state-of-the-art of cleaning toxic gases from rocket exhaust gases resulted in the selection of a system which will remove the toxic products and provide a method for disposal of these products. The removal system consists of spraying a potassium hydroxide solution into the high velocity gas which chemically cleans the gas. The resultant compounds are flushed to an imperviously lined evaporation pond where the water evaporates and the salts are collected. The system selected should be applicable to engines of different thrust levels provided components are properly sized. The study included application of this type of system to 1000, 5000, 50,000, and 250,000 pound thrust rockets; and a pilot model system was designed for a 5000 lb thrust rocket engine. Specifications and drawings were prepared for the pilot system. Costs are cited. (Author summary modified)

35742 **APTIC NO. 59253**

Gordon, J. S., R. D. Glenn, S, Ehrlich, R. Ederer, J. W. Bishop, and A. K. Scott

STUDY OF THE CHARACTERIZATION AND CONTROL OF AIR POLLUTANTS FROM A FLUIDIZED-BED BOILER -- THE SO2 ACCEPTOR PROCESS. (FINAL REPORT). *Pope, Evans and Robbins, Inc., Alexandria, Va., Environmental Protection Agency Contract CPA 70-10, Program Element 1A2013, EPA-R2-72-021, 303p., July 1972. 36 refs.*

A sulfur dioxide acceptor process was developed which is an atmospheric pressure, coal-fired fluidized bed boiler concept for steam and power generation. Coal is burned in a fluidized bed of crushed lime in the boiler s primary combustion zone; the partially sulfated lime is continuously regenerated (by reductive decomposition) in another zone. High combustion efficiencies are achieved by recycling, to a Carbon Burnup Cell, the carbon-containing fly ash which is carried out of the primary combustion zone. Experimental work was conducted in a 100 lbs coal/hr batch combustor and in a continuous 800 lbs coal/hr pilot boiler, to demonstrate system operability including: high degrees of sulfur removal in the primary combustion zone; high levels of SO2 in the off-gases from the regeneration zone, suitable for sulfur recovery; and high combustion efficiencies. Preliminary designs and cost estimates are presented for 30 Mw and 300 Mw boilers. The boiler is advantageous in the control of nitrogen oxides, hydrocarbons, carbon monoxide, and other pollutants, as well as SO2. The boiler operates at high ari rates and can achieve 99+% combustion efficiency.

35743 **APTIC NO. 58364**

Higashino, Ichiro, Shigeyuki Morita, Tomohiro Nomura, Hiroshi Kuroda, and Kohei Enmeiji

OPTIMALIZING CONTROL FOR EXHAUST EMISSIONS. *JARI Tech. Memo. 10, p. 385-397, Dec. 1972. 3 refs.*

The parameters of spark ignition engines were studied to determine the best parameters for controlling exhaust emissions and giving maximum thermal efficiency. The air/fuel ratio and spark timing were controlled with an electronic data processing unit, an actuator, a mini-computer, and a gas sampling system. The experimental equipment is described in detail.

35744 **APTIC NO. 59219**

Kerr, Clayton P.

SULFUR DIOXIDE REMOVAL IN VENTURI SCRUBBERS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., 33p., 1972 (?). 4 refs.*

Experimental data obtained from demonstration-sized pilot plants, were used to obtain fitted constants for the correlations developed for predicting sulfur dioxide removal from venturi scrubbers. From the correlations, conclusions were drawn regarding the magnitude of the various resistances to mass transfer. The theory of SO2 removal in the scrubbing liquor of the venturi scrubber is described and compared with experimental results. Pilot plant data with strong sodium carbonate solutions as a scrubbing liquor were used to determine the effective length of the scrubber; an effective length of 2.5 in. yielded mass transfer coefficients equal to the calculated coefficients, when there was no solids dissolution resistance or liquid-phase resistance. When liquid-phase diffusion controls, effective lengths were 3 in. Pilot plant data with lime slurries and magnesium oxide slurries fit the equations with the solids dissolution resistance exuded and 2.5 in. as the scrubber length. The expression for the liquid-phase mass transfer coefficient was independent of physical and transport properties, and only experimental data were reactant stoichiometries were approximately one were used. Limestone slurries were only sparingly soluble; and if the liquid compositions remained close to the dilute equilibrium compositions, then the resistance in series model should be adequate for presentation of data. The pilot plant data with limestone slurries was fitted with the solids dissolution resistance included. The constants fitted with 99% confidence limits, the correlation coefficient, and the F levels are summarized. Experimental data and least squares fit is presented based on a venturi length of 2.5 in. The relative magnitudes of various resistances to mass transfer are listed; the more soluble systems, such as magnesium oxide or lime, had less liquid-side resistance than the less soluble limestone system (corrected for solids dissolution).

35745 **APTIC NO. 58682**

Kukhtitskiy, O. L., L. M. Yur eva, P. N. Miloserdov, G. K. Goncharenko, and Ye. I. Orlova

CLEANING GASES CONTAINING SURFACTANTS. *(Ochistka gazov, soderzhashchikh poverkhnostnoaktivnykh veshchestv). Text in Russian. Neftepererab. Neftekhim., no. 5:48-49, 1972. 4 refs.*

Pilot and full-scale experiments with fluidized-bed scrubbers for the removal of surface-active agents such as sodium sulfate from waste gases generated in detergent and washing powder manufacturing processes are described. Pinewood cubes with the dimensions 30 by 30 by 30 mm and with a specific gravity of 0.7 were the best as filling for the scrubbers. An industrial scrubber filled with such pinewood cubes in a 200 mm layer was highly effective in the removal of Na2SO4 from waste gases at a spray density of 6.5 m/m/hr until the Na2SO4 concentration in the wash liquid reaches 25%. Another scrubber, filled with polyethylene cubes in layers of 90 mm and 180 mm on two plates spaced at 700 mm, was designed for a capacity of 20,000-22,000 cu m/hr at an inlet gas temperature of 128-135 C. With initial dust concentrations of 7.76-8.62 g/cu m and acid concentrations of 84.6-115.2 mg/cu m, the efficiency of the scrubber was 94.8-96.4%.

35746 **APTIC NO. 59500**

Lefebvre, Arthur H

CURRENT PROBLEMS AND TRENDS IN GAS TURBINE COMBUSTION. Preprint, 38p., 1972. 61 refs. (Presented at the International Symposium on Air Breathing Engines, 1st, Marseille, France, June 19-23, 1972.)

NTIS: N73-30882

Current problems and trends in gas turbine engine development are reviewed, including the formation and control of exhaust emissions. The airblast atomizer is providing a practical solution to the problem of exhaust smoke, but satisfactory abatement of the other main pollutants calls for a more sophisticated approach to combustion design. Both variable geometry and two-staged systems appear to have considerable potential as low emission combustors, with attendant benefits in terms of superior ignition performance and a wider burning range. Means for minimizing carbon monoxide and unburned hydrocarbon emissions include: improved fuel atomization, primary zone mixture strengths nearer to stoichiometric, increase in primary zone volume, and reduction of film cooling air. Reduction of nitrogen oxide emissions is best achieved by lowering the reaction temperature.

35747 **APTIC NO. 58687**

Lewis, Clifford J.

NEW CONCEPT IN SCRUBBING GASES FROM COAL BURNING POWER PLANTS AND METALLURGICAL SMELTERS. *Preprint, 10p., 1972. (Presented at the Air Pollution Control Conference, 11th Annual, West Lafayette, Ind. Nov. 1, 1972.)*

A new concept is described for the design of an apparatus to remove sulfur dioxide and particulates from the off gases of coal burning power plants and metallurgical smelters. The design of the scrubber is based on the premise that solid material cannot adhere to a surface bathed by a moving liquid, the liquid being an aqueous slurry of hydrated lime in this case. A second design premise is that low pressure drops across the scrubber will be achieved if the gases pass over surfaces of the aqueous scrubbing medium rather than through the medium. A rotating cylinder containing internal tumbling media was constructed to translate the above concept into a mechanical device with the following objectives: prevention of scale formation upon the surfaces of the scrubber, low pressure drop across the scrubber, high efficiency in scrubbing sulfur dioxide and particulates from the gas, simple construction capable of being extrapolated to commercial size, easy access for maintenance, and relatively low power requirement. Operation of the scrubber for 21 days on the gases from a lower sulfur coal (1/2%) and for 25 days on the gases from a high sulfur coal (3.3%) produced results up to all expectations. Selected test data from 300 test runs are presented.

35748 **APTIC NO. 58307**

Matsuoka, Shin, Masaru Murata, and Hikaru Tsuruta

REGARDING THE CORRELATION BETWEEN THE AIR-FUEL RATIO, FLOW VELOCITY, COMBUSTION VARIATION AND NOX CONCENTRATION. *Tokyo Inst. of Tech. (Japan), Japanese Assoc. of Railway Industries Technical Memorandum No. 10, p. 107-110, Dec. 1972.*

Exhaust gas concentrations of nitric oxide and variations in cylinder pressure were measured for different swirl velocities (controlled by shrouded valves) and different air-fuel ratios. When the air-fuel ratio is made constant for lean mixtures (the theoretically correct ratio is 15.2), an increase of flow velocity reduces the pressure variation (driveability), but NO concentration increases. In rich mixtures an increase of flow velocity will reduce the pressure variation without increasing NO concentration. On the lean side of the air-fuel ratio, both an increase in flow velocity and a leaner mixture are required in order to reduce NO without losing driveability, so that output decreases. On the richer side, only an increase in flow velocity is required, so that output is not decreased.

35749 **APTIC NO. 58315**

Matsuoka, Shin, Hidenori Tasaka, and Yoshiyuki Tsuzibayashi

STUDIES ON TWO METHODS REGARDING NOX EMISSION CONTROL IN SI ENGINE: CALCULATIONS OF BLOWBACK AND BURNED GAS FRACTION CAUSED BY VALVE OVERLAP AND NOX EMISSION CONTROL. *Tokyo Inst. of Tech. (Japan), Japanese Assoc. Railway Industries Technical Memorandum No. 10, p. 99-106, Dec. 1972.*

The influence of gas temperature and composition on combustion (ignition delay) was investigated in the internal exhaust gas recirculation method for reducing engine emission of NOx. The amount of burned gas was predicted by simulation of the intake process. Calculations are made for different opening and closing times of the intake valves and for different extents of throttling. Pilot experiments were performed to measure the amount of recirculated gas and accompanying NOx concentration for different valve timings. For this purpose a higher degree of accuracy of measurement of cylinder CO2 during the compression stroke and of the air-fuel ratio in the 15-18 region are needed, as well as an estimate of gas temperature at the start of compression. The analytical method should be modified to heat transfer into account. To find the optimum valve timing with respect to output, fuel consumption, and NOx formation, a number of combinations of engine operating conditions and possible engine modifications must be tried experimentally.

35750 **APTIC NO. 59164**

McCrea, D. H., G. J. Cinquegrane, R. J. Leister, and E. F. Forney

EVALUATION OF SOLID MINERAL WASTES FOR REMOVAL OF SULFUR FROM FLUE GASES. *Bureau of Mines and IIT Research Inst., Proc. Miner. Waste Util. Symp., 3rd, Chicago, Ill., 1972, p. 153-160. 5 refs. (March 14-16.)*

Solid mineral wastes were tested for ability to absorb sulfur dioxide. More than 20 materials are available in large quantity, have thermodynamic potential of reacting with SO2, and can be supplied to the U. S. for less than $20/ton. The reactivity of these materials toward SO2 was determined over a temperature range of 130-170 C. In most cases, SO2 was absorbed, but capacity and rate of absorption were low. However, red mud and lead-zinc ore tailings absorbed substantial quantities of SO2. Lead-zinc ore tailings consist primarily of dolomitic carbonates. Their use was evaluated in differential kinetic experiments and by injection into a small pulverized coal-fired furnace. Injection of the tailings is probably less attractive than injection of limestone. Red mud, the by-product of bauxite refining, was also studied in differential kinetic experiments and by injection into the furnace. When the injection method was used, the short residence time prevented efficient SO2 removal. If a reactor was employed to increase residence time, a high degree of SO2 removal could be obtained at 550 C. The red mud could be thermally regenerated at 650 C. A conceptual regenerable process is suggested. (Author abstract modified)

35751 **APTIC NO. 58318**

Miyabe, Hiyeda and Tatsuro Shimomura

REDUCTION OF NOX BY A WHISKER CATALYST. *Meiji Univ. (Japan), Japanese Assoc. of Railway Industries Technical Memorandum No. 10, p. 411-415, Dec. 1972.*

A copper-based whisker catalyst was developed for the reduction of nitrogen oxides in the exhaust gas from a gasoline engine. To obtain the characteristics of catalytic activity an experiment was performed with a small reactor heated by an electric furnace. Nitrogen oxides can be reduced quite effectively with a low mass of catalyst when the air-fuel ratio is below 14. For the reduction of nitric oxide in exhaust gas, an air-fuel ratio near 13 is suitable. However, due to the necessity of reducing carbon monoxide simultaneously, high activity at the air-fuel ratio near 14 to 14.5 is desirable. In this respect, the whisker catalyst is still very promising, but needs improvement.

35752 **APTIC NO. 59055**

Rudey, Richard A.

AIRCRAFT ENGINE POLLUTION REDUCTION. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA-TM-X-68129, 10p., 1972. 9 refs. (Presented at the EASCON, Washington, D. C., Oct. 16-17, 1972.)*

The effect of engine operation on the types and levels of major aircraft engine pollutants is described. The major factors governing the formation of these pollutants during the burning of hydrocarbon fuel are discussed. Jet engine emissions include nitrogen oxides, hydrocarbons, and carbon monoxide, which can be reduced by air-assist fuel injection, water injection, fuel prevaporization, fuel-air premixing, and engine design modifications. Several experimental research programs on control methods are discussed. A low pollution combustor design program uses a swirl-can modular combustor and several other unconventional contractor combustor designs.

35753 **APTIC NO. 58634**

Sass, Samuel and Paul M. Davis

LABORATORY RESEARCH ON THE INCINERATION OF MUSTARD. *Edgewood Arsenal, Edgewood Arsenal, Md., Chemical Lab., p. 285-299, 1972. 14 refs.*

NTIS, DDC: AD 750372

The incineration of the vesicant agent sulfur mustard was studied in the laboratory to supply information about the fundamental chemistry for the design, fabrication, and operation of a mustard incinerator. Since sulfur mustard, bis(beta-chloroethyl)-sulfide, is readily flammable, incineration is the most economical means for large-scale destruction of surplus stores. Operating variables such as amount of oxygen, mustard residence time, and additional fuel (propane) needed were studied to obtain the most efficient incineration possible. Effluents were analyzed for sulfur oxides, mustard sulfur, nitrogen oxides, hydrogen chloride, and other pollutants. Calcium carbonate slurries were tested as the alkaline scrubbers (bubblers) to collect HCl and SOx. Sodium hydroxide was used as a final trap and as the main trap for SOx. On the two all-glass incinerators operating at 800 C, a mustard destruction efficiency of better than 99.9994% was assured. The efficiency was limited only by the relatively small amount of mustard burned (up to 13.1 g/experiment) as reflected in the sensitivity threshold for mustard detection. Air flows tested represented O2 supply to O2 demand ratios of 1.13 to 9.94. The 1.13 ratio was sufficient for complete combustion. Experimental residence time of mustard at furnace temperature ranged from 0.14 to 2.22 sec. Practically all of the mustard was mineralized, even at a residence time as low as 0.14 sec. Calculations based on steady-state conditions at this residence time indicated attainable incineration efficiencies that are orders of magnitude higher than those proved experimentally. Scrubber tests under direct absorption conditions (no recycle) showed that sodium hydroxide and sodium bicarbonate gave collection efficiencies of 98%+ of the HCl and 95%+ of the SOx. Chemical analysis of scrubber salt composition and subjective odor tests versus pH, indicated that absence of odor can be assured from hot salt solution or dry salt, if the scrubber system is maintained above pH 7.5. Analytical methods for SOx, NOx, HCl, and carbon dioxide are described including gas/liquid chromatography and colorimetry. (Author conclusions modified)

35754 **APTIC NO. 59268**

Shaw, Henry

FUEL MODIFICATION FOR ABATEMENT OF AIRCRAFT TURBINE ENGINE OXIDE OF NITROGEN EMISSIONS. FINAL REPORT. *Esso Research and Engineering Co., Linden, N. J., Government Research Lab., Air Force Aero Propulsion Laboratory Contract F33615-71-C-1575, Proj. 306605, AFAPL-TR-72-80, Esso Rept. GRU.1GDJA.72, 72-2687, 122p., Oct. 1972. 33 refs.*

NTIS, DDC: AD-752 581

A broad experimental program was undertaken to assess the feasibility of reducing nitrogen oxides from aircraft gas turbine engines by fuel modification. The Esso High Pressure Cannular Combustor was used to simulate the characteristic emissions of gas turbines at full power operation. Over 70 fuel modifications were tested using Jet A as the base fuel. Soluble compounds of cobalt, iron, magnesium, and copper reduce NOx by as much as 30% when added to the fuel at a treat rate of up to 0.5% (w). Compounds of sodium reduce NOx by as much as 26% when added as suspensions or in aqueous emulsions. An aqueous emulsion containing 37 ppm (w) hydrazine acetate reduces NOx by 15%, but this modification was not consistently effective. None of the investigated additives were fully acceptable because of the relatively low NOx reduction that was obtained even with high additive treat rates. A simple expression was derived which is useful in estimating nitric oxide levels in gas turbine combustors when equilibrium NOx concentrations and temperature are known. (Author abstract)

35755 **APTIC NO. 59205**

Tanaka, Satoru

THE PRESENT SITUATION OF ENVIRONMENTAL POLLUTION (KOGAI) IN YOKKAICHI AREA AND OUR CONTROL. *Mie Prefecture (Japan), 12p., 1972.*

The occurrence and control of environmental pollution in the Yokkaichi area of the Mie Prefecture are discussed. Air pollution is caused by the large amount of emissions from the steam power installation chiefly using heavy oil refineries, and many petrochemical factories. As the percentage of heavy oil in fuel is very high, the most serious trouble is sulfur oxides, but its average concentration is not always high, compared with those of other industrial cities. Wind direction influences the severity and location of the pollutants. The frequency of the high concentration is decreased by elevating chimney heights and using fuel with less sulfur content. The amount of dust fall in Yokkaichi City was 12.6 tons/sq km a month on an average in 1970, with 15 tons falling during the summer. In 1965, 76% of complaints were for odors, but in 1970 the percentage decreased to 57.3%. Odors come from sulfur, hydrogen, organic sulfur compounds, and various hydrocarbons. Efforts for pollution control include regulations under laws, expenditures by industry, and continuous monitoring. Medical care is provided for sufferers from air pollution in Yokkaichi. Currently there are 817 patients receiving assistance.

35756 **APTIC NO. 58872**

Thompson, Theos J.

NUCLEAR POWER PLANTS: PRESENT, PAST, AND FUTURE. *In: The Environmental and Ecological Forum 1970-1971. Atomic Energy Commission UC-2, TID-25857, p. 57-71, 1972.*

The environmental impact of nuclear power plants are discussed, including thermal effects and radiation. The increase of population and industrialization has caused increased energy consumption and use of fossil fuel. This has also caused increased air pollution due to fossil fuel use. Carbon dioxide emitted by fossil fuel combustion may cause weather modifications. Nuclear fission and fusion are the only reasonable alternative energy sources. The principles, efficiency, and use of nuclear power sources are discussed. Nuclear gaseous and liquid effluents and their diffusion are discussed.

35757 **APTIC NO. 59238**

Volsy, Robert

TWO NEW APPARATUSES FOR THE ELECTROSTATIC PRECIPITATION OF AEROSOLS: 1. BY GLOBAL SAMPLING, 2. BY GRANULOMETRIC SEPARATION. *(Deux nouveaux appareils de precipitation electrostatique d aerosol 1. a prelevement global 2. a separation granulometrique). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 9p. 3 refs. (May 3-5.)*

Two new apparatuses for the electrostatic precipitation of aerosols, one operating by global sampling without fractionation and another for granulometric separation, are described. Both apparatuses are required to collect at least 10 mg of dust during not more than 24 hr of autonomous operation. The global sampling precipitator is composed of a parallelepipedic chamber in which a point electrode in the form of a longitudinal filament is inserted. The dust is captured uniquely on the plane electrode around the point electrode, and turbulence is prevented by supporting the electric wind with air. The other precipitator, designed for granulometric separation, is composed of an ionizing chamber similar to the first apparatus in which, however, there is no precipitation, and another precipitation chamber similar to an Erikson ion spectrometer, in which the charged aerosol is injected through a nozzle in the form of a thin blade whose thickness is small relative to the electrode gap, and which jet is stabilized by air.

35758 **APTIC NO. 59231**

Walkenhorst, W.

STUDIES CONCERNING THE IMPROVEMENT OF THE SEPARATING EFFICIENCY OF DUST FILTERS BY INCREASED ADHESION. *(Untersuchungen zur Verbesserung des Abscheidegrades von Staubfiltern durch Erhoehung der Haftkraft). Text in German. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Pollueees, Proc., Paris, France, 1972, 10p. 5 refs. (May 3-5.)*

Experiments concerning the improvement of dust separating efficiency for dust filters by increasing the adhesion of the dust particles to the filter surface by the application of potential and/or atomized olive oil, paraffin oil, or glycerine in the air flow are described. The experiments were performed with coal dust smaller than 15 micron, on iron wire netting with 0.53-1.8 mm mesh and wires thicknesses of 0.2-0.35 mm. The wires were coated with plastic material, and plastic fiber netting of identical mesh was interposed between two iron nettings. The additives were added at an expenditure smaller than 5 mg/cu m, and they were retained nearly quantitatively, the concentrations after the filter being less than 1 mg/cu m. The separation efficiency had its maximum at a flow rate of 180 cm/sec when neither potential nor additives were applied. With potential but without additive, the efficiency was higher than that measured without potential up to a flow rate of 4 m/sec, while the use of additives, especially of olive oil, either with or without potential applied, resulted in very strong increase in the separation efficiency and values exceeding 85% were achieved even at flow rates as high as 10 m/sec.

35759 **APTIC NO. 58865**

Walsh, James R. and U Rus Hugi

INSTRUMENTATION OF AN ALKALI SCRUBBING TEST FACILITY. Instrument Society of America, Pittsburgh, Pa., Proc. Instr. Soc. Am., Conf. Exhibit, Annu., 27th, New York, 1972, 7p. (Oct. 9-12.)

The development and instrumentation of an alkali scrubbing test facility for the removal and sulfur dioxide from flue gas are described. The test facility incorporates centralized electronic process control with a digital data acquisition system provided to log process variables and print normal (alarm) conditions. Flue gas SO2 is measured by ultraviolet analyzers and analysis of the total gas stream is by gas chromatographs. Other topics discussed include: instrumentation loop applications to a 90,000 cfm alkali scrubbing test facility, the process problems the instrumentation engineer faces in selection of equipment, the performance of the instruments selected, and the problems encountered during start-up. (Author abstract modified)

35760 **APTIC NO. 59469**

Humble Oil and Refining Co., Corporate Planning Dept.

NATURAL GAS AND LPG POWERED VEHICLES. (FINAL REPORT). *26p., Feb. 1972.*

The potential impact of using natural gas and liquefied petroleum gas as vehicular fuels has been assessed in terms of the potential extent of penetration, corresponding supply and demand implications, and the possible effects on pollutant emissions. Hydrocarbon, carbon monoxide, and nitrogen oxide pollutant emissions from motor vehicles appear reducible in the near term by a maximum of about 10% with the substitution of natural gas for gasoline in fleet vehicles in urban areas. The emission reduction incentives, however, will be temporary because modified gasoline engine operation is anticipated to reach natural gas emission levels by 1975-76. The limited supply of natural gas will require its replacement by alternative fuels in the industrial sector and will thus result in increases in sulfur oxide, particulate matter, and nitrogen oxide emissions in this sector, thereby partially offsetting the emission reductions achieved in the transportation sector.

1971

35761 **APTIC NO. 58713**

Czermak, H. and K. Goebel

OPERATING EXPERIENCE WITH A COMBINED-CYCLE GAS TURBINE AND STEAM TURBINE PLANT AT THE HOHE WAND POWER STATION OF THE NIEDEROESTERREICHISCHE ELEKTRIZITAETSWERKE ANTIENGESSELLSCHAFT. *Inst of Mechanical Engineers, London (England), Steam Plant Group and Koninklijk Inst. van Ingenieurs (Netherlands), Mod. Steam Plant Pract. Proc., Gravenhage, Netherlands, 1971, p. 107-113, 125-148. 3 refs. (April 28-30, Paper C89/71.)*

The first high-merit steam plant in Europe to use a Topping gas turbine is described. The reasons for selecting a combined cycle plant and the thermal cycle used are explained. Modes of operation, the boiler combustion air system, the boiler firing system, outages and defects, and general running conditions are discussed. The gas turbine exhaust is used as the combustion air for any of three different boiler fuels (natural gas fuel oil, or coal) in the fuel-firing system. This results in lower sulfur trioxide emissions and reduced corrosion. The compositon of the turbine exhaust is: 17.6% oxygen by volume, 1.6% carbon dioxide, 3.3% water, 0.1% methane, and 77.4% nitrogen. The exhaust contains no sulfur dioxide. Flame lengths were studied in order to achieve complete combustion. When burning oil in fresh air, the flame was long and narrow and stretched practically the length of the furnace. When burning oil in turbine exhaust, the flame was much shorter and wider. The combustion of natural gas is either turbine exhaust or fresh air resulted in similar flames. Costs are cited. The mean annual net efficiency calculated from the fuel comsumption and the useful power supplied to the system is about 40%.

35762 **APTIC NO. 59037**

Dean, Karl C.

RECYCLING AUTOMOTIVE SCRAP. *National Assoc. of Secondary Material Industries, Inc., New York, and Bureau of Mines, Washington, D. C., Eff. Technol. Res. Scrap Met. Recycling, Proc. Workshop, Washington, D. C., 1971, p. 22-31. (Jan. 7.)*

As incineration is necessary prior to baling and desirable prior to shredding, the problem of designing, building, and operating a flexible smokeless incinerator of moderate capacity was studied. A refractory-lined, garage-type incinerator with a natural gas afterburner designed for quick loading, burning, and discharge of two cars at a time would meet the requirements of simplicity, relatively low capital and operating costs, and effective smokeless burning of properly prepared cars. A garage-type incinerator consists of three principal components: a primary burning chamber in which the combustibles are ignited and burned, an afterburner chamber in which the smoke is further heated and consumed, and a stack which creates a controlled draft for drawing in air from below the burning cars in the primary chamber and withdrawing the gaseous products for discharge. The design and operation of such an incinerator is described.

35763 **APTIC NO. 59046**

Ginsburg, Thomas H.

TECHNOLOGY AND RESEARCH IN THE SECONDARY ALUMINUM SMELTING INDUSTRY. *National Assoc.*

of Secondary Material Industries, Inc., New York, and Bureau of Mines, Washington, D. C., Eff. Technol. Res. Scrap Met. Recycling, Proc. Workshop, Washington, D. C., 1971, p. 63-69. (Jan. 7.)

Air pollution problems in the aluminum smelting industry and present solutions are reported. Emissions (unburned hydrocarbons) from drying wet, oily aluminum borings and turnings are controlled by putting the volatilized moisture and oil from kiln-type rotary dryer through afterburners to consume smoke. If scrap-containing paint or oil is charged directly into furnaces without drying, the furnaces must be provided with hoods over the charging wells to collect the smoke, and then the smoke drawn into an afterburner to consume the unburned HC. The biggest single problem in recycling Al scrap is control of emissions resulting from the chlorination which reduces magnesium in aluminum scrap to an acceptable limit of .10%. Chlorine gas is bubbled through the molten Al alloy and combines with the Mg (and Al) to create a number of air pollutants. Current city, county, state, and Federal air pollution control legislation makes mandatory the use of proper air pollution control equipment such as high energy wet venturi-type scrubbers or other devices to control emissions. While most smelters are using these scrubbers, they are not efficient, are maintenance nightmares, and expensive to operate. There is still much improvement and research and development necessary in this area.

35764 **APTIC NO. 58733**

Hijszeler, C. and K. van Duinen

EXPERIENCE WITH NATURAL GAS FIRING IN LARGE BOILERS. *Inst. of Mechanical Engineers, London (England), Steam Plant Group and Koninklijk Inst. van Ingenieurs (Netherlands), Mod. Steam Plant Pract. Proc., Gravenhage, Netherlands, 1971, p. 114-123, 125-150. (April 28-30, Paper C97/71.)*

The use of natural gas in large steam boilers has increased greatly in the Netherlands since Groningen natural gas was made available to Dutch industry. A survey is given of boilers in large industrial plants that use natural gas. The gas supply system is designed for maximum security of gas delivery at reasonable cost. To ensure operational safety of gas-fired plants, regulations have been drafted for these installations. Fuel supply systems that are considered safe are described. The practical experience of firing natural gas in boilers which is discussed centers around the specific combustion characteristics of natural gas. Both burner and boiler design criteria are discussed. Natural gas makes possible the use of a small number of large-size burners, due to the wide turn-down ratios realized with natural gas. Experimental work in test furnaces is required to achieve optimum designs. Special attention must be given to the tendency of burners to generate noise and pulsation problems. To obtain optimum results of gas-firing, the boiler design should be adjusted to natural gas firing. The radiation characteristics of a gas flame are different from those of pulverized coal and oil flames, as well as the flue gas rate. Results are shown for conversion of coal and oil-fired boilers to natural gas firing and new designs. The absence of sulfur in Dutch natural gas makes it possible to drop the exhaust temperature of the boiler below the temperature of oil-fired boilers. (Author abstract modified)

35765 **APTIC NO. 59502**

Hurkamp, C. H., W. M. Johnston, and J. H. Wilson

TECHNOLOGY ASSESSMENT OF ADVANCED GENERAL AVIATION AIRCRAFT. *Lockheed-Georgia Co., Marietta, Ga., Advanced Concepts Dept, National Aeronautics and Space Administration Contract NAS2-5972, Rept. CR-114339, 379p., June 1971. 159 refs.*

NTIS: N71-35210

An assessment of the potential impact of advanced technology in 1985 on four classes of general aviation aircraft is presented along with recommendations in areas were further research and development will help to realize the potential improvements. Oxides of nitrogen, probably created in the high temperature flamefront, will require additional research for achievement of tolerable levels, although fuel injection and dual ignition are both proving helpful at present. Carbon monoxide and hydrocarbons are and will be a lesser problem since the manner of aircraft operation assures an optimum fuel/air ratio most of the time. The smoke trail from turbo engines can be eliminated by proper design of the combustion chamber. Exhaust gas emission control will significantly reduce the emission of all major contaminants to an acceptable level.

35766 **APTIC NO. 58631**

Ibragimov, F. Kh., N. Kh. Valitov, G. M. Panchenkov, and G. I. Sivak

RECOVERY OF SULFUR DIOXIDE FROM INDUSTRIAL WASTES. *Sov. Chem. Ind. (English Translation from Russian of: Khim. Prom.), no. 9:625-627, Sept. 1971. 4 refs.*

The recovery of sulfur dioxide from industrial stack gases is reviewed. Absorption, adsorption, and catalytic oxidation are used for purifying industrial waste gases. A method of catalytic SO2 oxidation, using catalysts such as sulfur-vanadium-silica gel (SVS) and SVD was studied experimentally. Waste gases containing less than 1% SO2 were subjected to oxidation. Under identical conditions, the degree of SO2 conversion to sulfur trioxide, in the presence of the SVS catalyst was somewhat higher than in the presence of the SVD. In the optimum temperature zone, the degree of conversion was practically the same. The temperature of the catalyst bed was important to SO2 conversion. The rate of SO2 oxidation was determined relative to the concentration of SO2 and oxygen in the initial gas mixture. At 450 C with an initial O2 concentration of 7%, the SO2 content was changed from 0.2 to 5.0% for a gas-SVS contact time of 0.5-4.5 sec. The degree of conversion to SO3 was reduced with an increase in SO2 concentration, and the SO3 yield was increased with an increase in time. The degree of SO2 conversion as a function of time for various concentrations of SO2 in the initial gas and as a function of O2 content of initial gas in the presence of SVS and SVD catalysts was determined. It was possible to lower the SO2 content of the waste gases from 0.2-0.3 to 0.02%.

35767 **APTIC NO. 59474**

Jugel, W. and J. Lotze

STATE OF THE ART OF DUST SEPARATION BY MEANS OF TISSUE FILTERS. *(Stand der Technik auf dem Gebiete der Staubabscheidung mittels Geweben). Text in German. Luft- Kaeltetech., no. 4:181-186, 1971. 28 refs.*

State of the art are current trends in the area of dust separation by means of tissue filters are presented. Inertia and diffusion forces are chiefly responsible for the dust separation by tissue filters. The inertia increases with increasing particle mass and increasing flow rate, while diffusion effects are essential for dust separation only below a given particle size and below a definite flow rate. Tissue filters may reach efficiencies up to 99.9%, and combinations of tissue filters with cyclones, especially for high dust concentrations, are highly effective. Increase of the operating temperatures by the use of new, especially synthetic fibers, such as glass, nomex, and teflon fibers, the development of chemical-proof, high-strength fibers, reduction of the energy costs by the adoption of the module principle, reduction of the maintenance by the use of individual drive for the individual filter cells, and increase of the fiber strength by texturization are among the basic trends in the development of tissue filters and filter tissues.

35768 **APTIC NO. 59033**

Maki, E. R. and A. O. DeHart

A NEW LOOK AT SWASH-PLATE DRIVE MECHANISMS. *SAE (Soc. Automot. Engrs.) Trans., vol*

80:2712-2722, 1971. 52 refs. (Presented at the Society of Automotive Engineers, National Meeting, St. Louis, Mo., Oct. 26-29, 1971, Paper 710829.)

Swash-plate drive mechanics are described. Analysis which combines swash plate drive kinematics with hydrodynamic bearing theory, so a performance evaluation of the complete mechanism can be made, is presented. The predicted operating characteristics have been verified by tests on full size models. Operating experiences have shown the properly designed swash plate drive system is a competitive method for converting reciprocating motion into rotary motion. (Author abstract modified)

35769 **APTIC NO. 58879**

Opie, W. R.

PROBLEMS IN SMELTING COPPER SCRAP. *National Assoc. of Secondary Material Industries, Inc., New York, and Bureau of Mines, Washington, D. C., Eff. Technol. Res. Scrap Met. Recycling, Proc. Workshop, Washington, D. C., 1971, p. 52-54. (Jan. 7.)*

In copper reclamation there are two grades of consumer-generated secondaries that are real metallurgical challenges-insulated wire and iron bearing material. With the first, the basic problem is how to handle the organic insulation. Burning it off is the preferred solution but this creates pollution problems. A universal solution is to design and operate a smelting unit which will use as much of the heat of combustion as possible to melt the copper, slag off some impurities, burn the resulting gases to completion in an afterburner, and scrub the products of combustion with a basic solution to neutralize the hydrochloric and hydrofluoric acids. A feasible approach to handling iron-bearing secondaries is to smelt them in a unit with suitable fume collection afterburning and gas scrubbing equipment. The fumes which come off blast furnaces and converters treating the smelter-grade copper scraps are essentially zinc oxides contaminated with large quantities of lead, tin, iron, chlorides, and fluorides. These products are caught in baghouses which are essentially for operating without polluting the atmosphere.

35770 **APTIC NO. 59486**

Potter, G. M.

RECOVERY OF NONFERROUS AND PRECIOUS METALS FROM ELECTRICAL AND ELECTRONIC SCRAP. *National Assoc. of Secondary Material Industries, Inc., New York, and Bureau of Mines, Washington, D. C., Eff. Technol. Res. Scrap Met. Recycling, Proc. Workshop, Washington, D. C., 1971, p. 32-34. (Jan. 7.)*

Leaching of selected scrap with cyanide solutions, proprietary compounds, or acids may be very effective. However, such methods are not satisfactory for very complex scrap, even after incineration. The complex metal assortments contain natural precipitants for gold and silver. Strong acids are not selective enough or cheap enough for low-grade scrap. Smelting of complex scrap requires preliminary incineration to burn off plastics and other organics. Experiments with a pilot-size incinerator showed that fumes and precious metal losses can be reduced to negligible amounts by afterburning and wet scrubbing. Low aluminum scrap can be smelted to give an impure metal and a slag that can be sampled, assayed, and sold to a custom smelter for further processing. Alternatively, the metal can be drossed to remove iron, aluminum, and other impurities to give a copper-base bullion for wet electrolytic refining to recover copper and precious metals. High aluminum scrap is highly troublesome to smelt, as the slags are viscous and unmanageable. The extensive use of hand labor to remove aluminum from low-grade scrap is prohibitively expensive. Aluminum can be reached from scrap with caustic solution, consuming about 500 lb/ton, if the aluminate solution is hydrolyzed to regenerate the caustic. Aluminum can be sweated from scrap, but dissolves precious and other metals. However, promising work has been done on fused salt electrolysis purification of the sweated aluminum. If this approach is successful, it might well be the best method of handling high aluminum scrap. The sweated residue and electrolytic cell copper precious metal product would be smelted to copper-base bullion for wet electrolysis.

35771 **APTIC NO. 59260**

Starkman, Ernest S.

THE CHANCES FOR A CLEAN CAR. *Astronaut. Aeronaut., 9(8):68-75, Aug. 1971. 24 refs.*

A need exists to control emissions to levels presently legislated for 1975 model vehicles. Returning the atmosphere to acceptable quality and maintaining it until the year 2000 will require reducing vehicle exhaust emissions. Laboratory vehicles with gasoline reciprocating engines have demonstrated the possibility of reducing exhaust content of pollutants almost to levels prescribed for 1975. Steam, gas turbine, and Stirling-cycle engines have yielded emissions levels which are in some cases below the near-term requirements. However, they have yet to demonstrate that they will match equally clean gasoline piston engines in cost, operating economy, flexibility, and acceptability. In spark-ignition engines, natural gas and propane have yielded less-reactive hydrocarbons and carbon monoxide than gasoline. However, natural gas limits vehicle range and power. Requiring low vehicle emissions than those projected for 1975 or those demonstrated attainable in the laboratory with controlled conventional vehicles cannot be justified without also considering the relative contribution of pollutants from other sources. (Author conclusions)

35772 **APTIC NO. 58880**

Tauben, S. F.

PROCESSING WIRE SCRAP. *National Assoc. of Secondary Material Industries, Inc., New York, and Bureau of Mines, Washington, D. C., Eff. Technol. Res. Scrap Met. Recycling, Proc. Workshop, Washington, D. C., 1971, p. 59-62. (Jan. 7.)*

Reclaiming the metal values of insulated copper and aluminum wire while at the same time eliminating the burning-pollution problem is discussed. A system of mechanical wire chopping and separation that today is considered the model of the industry is described. A new process treats copper-content scrap and residue chemically, recovering all metal elements, including precious metals, and bypasses traditional pyrometallurgical methods. This process eliminates pollution in the atmosphere and allows for the economic treatment of low grade copper materials that heretofore could not be recovered. The plastic insulation is also recovered and used for mulch, fuel, filters, and insulation.

35773 **APTIC NO. 59193**

Watkins, Charles H. and Frank Stolfa

RECENT OPERATING RESULTS WITH RCD ISOMAX. *Proc. Am. Petrol. Inst. Div. Refining, 1971:713-731, 1971. 2 refs.*

Pilot plant stability test data on desulfurizing Kuwait reduced crude to 1.0 wt% sulfur over a series of improved catalysts are presented. The inhibiting effect of hydrogen sulfide on the desulfurization reaction was independent of catalyst formation and/or activity. Delta reactor peak temperature requirements ranging to 75 F while producing a product containing 1.0 wt% S were realized between various catalyst formulations. Recent data on three commercial RCD Isomax units currently operating are described in daily run plots. Analyses of charge and product streams along with yields and product distribution are presented. Future residual fuel oil sulfur requirements in the vicinity of 0.35 to 0.5 wt% S are examined and preliminary costs for two alternative routes to these lower S levels are compared. The comparison indicates that it will cost at least an additional 15.2 cents/bbl to reduce the S to 0.5 wt% from 1.0 wt%, and 23.1 cents/bbl to reduce it to 0.35 wt% from 1.0

wt%. The cost of reducing S to 1.0 wt% is approximately 57 cents/bbl. (Author abstract)

35774 APTIC NO. 58632

Zaytsev, V. A., V. I. Rodin, B. V. Gromov, L. N. Arkhipova, V. N. Senin, A. A. Novikov, and T. G. Repenkova

WASTE PRODUCTS FROM THE PRODUCTION OF PHOSPHATE FERTILIZERS AS POSSIBLE RAW MATERIAL FOR FLUORINE PRODUCTION. *Soviet Chem. Ind. (English translation from Russian of: Khim. Prom.), no. 547-550, Aug. 1971. 22 refs.*

The main mineral from which fluorine compounds are obtained is fluorspar. Fluorspar ores are categorized as chemical, metallurgical, and ceramic. The ever-increasing demand for fluorine compounds has increased the mining of fluorspar and decreased the fluorspar reserves. Thus new sources of fluorine are being studied, including apatite, a raw material for producing phosphate fertilizers. The fluorine content of apatite varies from 1.3-3.9%. If only 50% of the fluorine released during production of phosphate fertilizers were recovered, it would equal 700 thousand tons/yr. Reserves of fluorine contained in phosphorites and apatites in different countries are listed; they equal 25,867,000 and 776,000 tons of phosphorite and fluorine, respectively. The waste gases of simple superphosphate production contain 15-30 g/cu m silicon tetrafluoride on the basis of fluorine. The parameters of the technological system of wet-process phosphoric acid production by the dihydrate method and the amount of of alkaline metals in the initial stock have a considerable effect on the distribution of fluorine in the production of superphosphate. The various phosphate and superphosphate producing processes are reviewed with respect to their production of fluorine. Possible means of increasing the degree of isolation of fluorine in the production of phosphate fertilizers include decreasing the losses in the production of fluorine salts from fluorine-containing solutions; development of effective methods of isolating fluorine from wet-process phosphoric acid; and intensifying the processes of absorption of fluorine-containing gases.

35775 APTIC NO. 58614

THE COMBINED ELECTRICITY AND STEAM GENERATING POWER PLANT OF THE PONT-DE-CLAIX INDUSTRIAL COMPANY. *(Le centrale electricite/vapeur de la compagnie industrielle de Pont-de-Claix). Text in French. Rev. Fr. Energ., 22(228):149-153, Jan. 1971.*

The new thermal power plant of the chlorine-manufacturing Pont-de-Claix company, designed for the joint generation of electricity and steam for its own use, is described. The power plant includes eight independent units, each comprising a turbine and a boiler for heat recovery from the hot flue gases. The combined installed capacity of the power plant is 125 MW, and the steam generation capacity amounts to 370 ton/hr. The waste heat recovery boilers accept flue gases with a 500 C temperature, while the outlet temperature is 150 C. The efficiencies of the electricity and steam-generating units are 24% and 71%, a combined efficiency of 78%.

35776 APTIC NO. 58749

Aerospace Corp., El Segundo, Calif., Office of Corporate Planning

AN ASSESSMENT OF THE EFFECTS OF LEAD ADDITIVES IN GASOLINE ON EMISSION CONTROL SYSTEMS WHICH MIGHT BE USED TO MEET THE 1975-76 MOTOR VEHICLE EMISSION STANDARDS (FINAL REPORT). *Environmental Protection Agency Contract FO4701-71-C-0172, Rept. TOR-0172(2787)-2, 213p., Nov. 15, 1971. 144 refs.*

An assessment of data in the open literature on the effects of lead additives in gasoline was performed in relation to emission control systems which might be used to meet the 1975-76 motor vehicle emission standards. Use of leaded or low-lead gasoline with catalytic converters results in a great reduction of catalytic activity, thereby preventing the achievement of a 50,000 mile lifetime at sufficiently low emission levels to meet the required standards. Scavengers added to gasoline for the prevention of Pb deposit accumulation were also found to have detrimental effects upon catalysts. Lead effects on other major emission control system components, e.g., thermal reactors and exhaust gas recirculation systems, although observed to be present to some degree, were such that materials selection and design techniques could be applied to allow for lead-tolerant systems. Lead traps or exhaust gases of an engine using leaded gasoline, prior to passage through a catalytic converter, did not have adequate Pb removal capability or the technological development status consistent with other emission system components being considered for meeting 1975-76 standards. The estimated overall costs to the consumer (initial, operating, and maintenance) for emission control systems being considered for the 1976 Federal emission standards are approximately $860 above 1970 vehicle costs over an 85,000 mile vehicle lifetime.

1970

35777 APTIC NO. 59230

Frasca, Ralph L.

HANDLING OF INSULATED COPPER WIRE SCRAP. *National Assoc. of Secondary Material Industries, Inc., New York, Air Pollut. Control Technol., Proc. Workshop, Chicago, Ill., 1970, p. 107-116. (Oct. 22.)*

Some of the basic problems encountered in the removal of insulation during the recovery of the conducting materials and the type of auxiliary equipment necessary to operate within air pollution control regulations are discussed. The most frequently used method is burning off. The insulations considered are polyethylene, polypropylene, polyvinyl chloride, teflon, nylon, neoprene, rubber and paper. Once ignited, polyethylene generates hydrocarbon gases which burn intensely. Burning under controlled conditions, only carbon dioxide and water vapor will be emitted. The necessary controls consist of a primary combustion chamber in which the burning rate is limited, and a secondary combustion chamber which is fired by auxiliary fuel and provided with overfired air. A high temperature secondary combustion chamber with sufficient air supply will completely burn the volatilized hydrocarbons giving a clean or steamy plume. The removal of polypropylene is like that of polyethylene. Facilities to handle polyvinyl chloride insulated wire should include a primary distillation chamber provided with a means of supplying the heat and temperatures necessary to start and continue at a reasonable rate the combustion of this flame retarding material, a secondary combustion chamber with an auxiliary fuel fire plus overfired air to complete the combustion of the carbonaceous materials, and a scrubbing unit to remove the hydrogen chloride fumes and metallic salts. Paper insulation on burns with too many problems of an air pollution nature. Fly ash is the biggest problem and this can be removed by a cyclone, electrostatic precipitator, or a wet scrubber. Processing of nylon insulation with primary and secondary combustion chambers will emit a gas containing mostly carbon dioxide and water. Since hydrogen chloride will be generated by burning neoprene, the gases must be passed through a scrubber. The burning of teflon releases hydrogen fluoride, and great care should be exercised.

35778 APTIC NO. 58885

Krockta, Harry

GAS SCRUBBERS FOR INDUSTRIAL GAS CLEANING. *National Assoc. of Secondary Material Industries, Inc., New York, Air Pollut. Control Technol., Proc. Workshop, Chicago, Ill., 1970. p. 89-96, 111-116. (Oct. 22.)*

Gas scrubbers are described and their advantages and limitations pointed out. The operation of inertial or impingement scrubbers, wet fans or dynamic scrubbers, and high energy scrubbers (venturi or orifice type) is explained in detail. Three factors should be considered in selecting a scrubber: economic, environmental, and engineering. An attempt is made to formulate a rule of thumb for estimating scrubber costs, but since each unit is tailor-made to meet specific plant requirements, this is difficult. The performance of a gas scrubber is affected by the characteristics of the dust or fume to be collected, the concentration of the dust or fume in the gas stream, and the properties of the gas. This information is needed to determine not only the type of scrubber, but also the size and the materials of construction. The characteristics of the dust or fume which are important include: particle size, solubility in scrubbing liquid, chemical reactivity, and corrosion properties. The dust loading and the condition of the gas in which particulate matter is suspended are also important factors.

35779 APTIC NO. 58881

Mennell, Morris

ELECTROSTATIC PRECIPITATION. *National Assoc. of Secondary Material Industries, Inc., New York, Air Pollut. Control Technol., Proc. Workshop, Chicago, Ill., 1970, p. 97-103, 111-116. (Oct. 22.)*

The principles of electrostatic precipitation are explained, and the precipitator hardware is described. Design parameters and operating limits are given. There are three design parameters; the gas volume to be treated, the collection efficiency desired, and the precipitability of the material to be collected. For unfamiliar applications design errors are reduced by use of mobile plot precipitators and scale flow model studies. Precipitator installation and operating costs are briefly discussed. The chief disadvantage of precipitators is their relatively large size and high capital cost. Operating and maintenance costs are low. Precipitators have been designed for collection efficiencies approaching 100%.

35780 APTIC NO. 58612

Nelson, Arthur W., Jr.

AIRCRAFT TURBINE EXHAUST EMISSIONS. *Air Pollution Control Assoc., Pittsburgh, Pa., Proc. Air Pollution Control Assoc., Mid-Atlantic States Sect., Semi-Annu. Tech. Conf. Transp. Impact Air Pollut., Harrisburg, Pa., 1970, p. 53-58. (Oct. 8-9.)*

Aircraft turbine engine exhaust emissions include smoke, particulate matter, carbon monoxide, oxides of nitrogen, unburned and partially oxidized hydrocarbons, and sulfur oxides. The levels of invisible emissions from turbines are less than those of reciprocating engines, however the smoke plumes are more visible. Exhaust emissions from gas turbine-powered aircraft contribute only a small fraction of the nation s air pollution. Several fuels and fuel additives have been tested to suppress the formation of smoke. Redesign of the burner was the most effective approach to smoke reduction. Several programs are now being undertaken to study the mechanisms of formation of invisible aircraft emissions.

35781 APTIC NO. 58884

Spitz, Albert W.

AIR POLLUTION CONTROL BY PROCESS OPTIMIZATION. *National Assoc. of Secondary Material Industires, Inc., New York, Air Pollut. Control Technol., Proc. Workshop, Chicago, Ill., 1970, p. 122-127. (Oct. 22.)*

Frequently emissions can be materially reduced and on rare occasions eliminated by process or equipment changes rather than by adding on a control installation. In any case, reducing emissions at the process level will reduce the size and cost of any control equipment required. A number of examples are given. One involves not buying scrap material the processing of which is bound to produce inordinately large volumes of emissions, such as oily, or painted, or plastic-covered material. Other examples involve the conversion to 100% oxygen in processes of purification of aluminum and copper from scrap. Often, the redesign of furnaces is a useful step. Preliminary separation of a small part of the total material to be processed that contributes disproportionately to emissions may save money in a pollution control program. To achieve zero emission levels the use of chemical processes for the recovery of different metals is suggested.

1969

35782 APTIC NO. 58729

Bagwell, F. A., L. F. Cox, and E. A. Pirsh

FLUE-GAS FILTERING PROVES PRACTICAL ON OIL-FIRED UNIT. *Elec. World, 171(10):26-27, March 10, 1969.*

A bag-filterhouse system using fiberglass filter media with alkaline additives for removing particulate matter and sulfur trioxide from the flue gas from an oil-fired boiler is described. The filterhouse is a horseshoe-shaped structure centered around the stack. It contains 1272 cylindrical fiberglass filter bags. The filterhouse was installed on an oil-fired 320-Mw boiler which fires 154,000 pph of high-viscosity fuel oil with an average ash content of 0.06% and an average S content of 1.6%. Full load gas flow at the outlet of the regenerative heaters is 820,000 cfm at 258 F. Under these conditions, the filter ratio is 5.7:1 with all 12 compartments in service and 6.5:1 with one compartment out for cleaning. The alkaline additive is fed into the gas stream at the outlets of the air heaters and at the inlets to the individual compartments. It neutralizes the SO3 in the flue gas and forms a filter cake on the bag surface. Bags are cleaned every hour by reversing the gas flow for about 1 min. Total 1969 cost of the system is 14.2 cents per barrel for a 600-Mw unit.

35783 APTIC NO. 58615

Doberschuetz, G.

FACTORS AFFECTING THE DUST EXTRACTION IN VENTURI TUBES. *(Czynniki wplywajace na odpylanie w zwezkach venture). Air Conserv. (English translation from Polish of: Ochrona Powietrza, 3(6):32-41, 1969. 17 refs.*

NTIS: TT 70-55123/6

The effect of individual factors on the dust extraction efficiency of venturi scrubbers was studied. Reduction in pressure, water-air coefficient, speed in the constriction, and dust particle size were of considerable significance. The process of wetting and the quality of water are discussed. The droplet diameter equals the surface tension divided by the relative speed squared. The effect of electrical charge, the water-to-gas ratio, and the effect of dust concentration in the crude gas are described. The theoretical and practical knowledge of the various parameters permits the design of dust extraction venturi scrubbers with maximum efficiency. (Author abstract modified)

35784 APTIC NO. 58656

Hailstone, R. E.

AIR POLLUTION CONTROL IN THE CEMENT INDUSTRY. *Minerals Process., 10(5):11-15, May 1969.*

Efficient emission control equipment is essential for the proper operation of cement manufacturing plants because cement making involves selecting, proportioning, grinding, heating, and cooking, materials of sub-micron sizes. Technology has improved to the extent that, in some instances, emission control improvements can and should be made in the cement industry. The cost of the improved control is substantial. Proper emphasis should be placed on achieving technically feasible, economically reasonable, practically enforceable air pollution control regulations and determining logical priorities.

The need for improved air quality should not dictate identical needs or priorities for every geographical location in this country. Only through the cooperative efforts of control agencies, public, and industry will be able to achieve goals of desirable air quality. Because of the variety of sources and source characteristics, the control of air pollutant emissions is a complex problem. Technical factors frequently make necessary the use of different types of sources. Thus it is necessary to continue to improve, refine, and periodically revise the control technique information so that it will continue to reflect the most up-to-date knowledge available.

35785 **APTIC NO. 58673**

Kinney, J. F. and J. M. Akridge

SOLID WASTE CYCLONE INCINERATOR. *Georgia Inst. of Tech., Atlanta, Engineering Experiment Station, Proj. E-100-344, 61p., Jan. 1969.*

The results of a study of a cyclone-type incinerator as a possible means of efficiently burning peanut hulls without polluting the air are reported. A conical model was constructed to study advection. Natural advection of secondary air is not practical in the model tested and probably not in any model because of the high centrifugal pressure. Forced advection of secondary air in the model tends to encourage short-circuiting of the cyclonic flow out the stack in the model tested. The higher temperature creating less dense gases and a higher gas viscosity does not appear to be detrimental. Peanut hulls are readily separated in hot gases obtained from burning gas with air. Residence times greater than 1/10 sec are required to char peanut hulls in the model cyclone burner with 1000 F gases. Burning to ash will require longer residence time and probably higher temperature. A cylindrical cyclone with a contoured bottom plug may be better adapted for this service. A turbulent turnover compartment may be the compromise to burning materials such as peanut hulls which require a significant residence time to ash and still maintain velocities to insure particulate removal from the exhaust gases.

35786 **APTIC NO. 58617**

Kosart, I.

FUME AND DUST CONTROL SYSTEM OF A 50-TON ELECTRIC ARC FURNACE. *(Instalacja odpylajaca pieca lukowego 50t). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 3(6):4-12, 1969.*

NTIS: TT 70-55123/6

The construction of the first Polish fume withdrawal and control system for a 50-ton electric arc furnace is discussed. The system has a fume intake, heat accumulator, fabric filter, withdrawing fans, stack-ejector, withdrawal ductwork, and dust transporting device. The design and operation of the system are discussed. Measurements were made of the dust collection efficiency to determine the efficiency of the fabric filter, the operating efficiency of the heat accumulator, the pressure drop in the fabric filter, the fume flow rate in the system during the melting and refining stages, the dust concentration before and after the fabric filter, and the dust emission from the two arc furnaces. The efficiency of the fabric filter was 99.2%. Dust emission from both furnaces and a continuous operation of the fume control system to date amounts to 550 tons/yr. The dust extracting equipment stops about 2 tons of dust/day and releases into the atmosphere an almost invisible jet of gases.

35787 **APTIC NO. 58616**

Quitter, V. and J. Petroll

EFFICIENCY LIMITS OF CYCLONE DUST COLLECTORS. *(Granice skutecznosci odpylaczy cyklonowych). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 3(6):20-31, 1969. 10 refs.*

NTIS: TT 70-55123/6

Formulas are given for the relations of characteristic cyclone parameters, such as the pressure loss, dust collecting efficiency, limiting grain size, or separation and settling rates. Efficiency of cyclones can be estimated from these parameters. A minor rise in efficiency can be achieved through some forceful refinements of the design, accompanied by high expenditures for research along these lines. Design modification effects discussed include the effect of connecting pipes and of the exit helix, effects of direct connection of the pipeline to the cyclone collector, effect of the air vortex on the dust discharge, the effect of dust discharge pipe and of the intermediate tank on the dust separating efficiency, the effect of the exit pipe of special design on the pressure loss and the dust collecting efficiency, and the effect of inward inverse suction. (Author abstract modified)

1968

35788 **APTIC NO. 58654**

Murray, F. E.

THE OXIDATION OF KRAFT BLACK LIQUOR. *Pulp Paper Mag. Can. (Quebec), 1968:3-7, Jan. 5, 1968. 19 refs. (Presented at the Sanibel Conference on Kraft Mill Air Pollution sponsored jointly by the U. S. Public Health Service and the University of Florida, April 25-28, 1967.)*

The oxidation of kraft mill black liquor is discussed. The reaction mechanism seems to involve two steps in converting the sulfide in solution to thiosulfate. In the first step, polysulfide is formed. After this there are two ways in which the reaction may proceed: the end product may be elemental sulfur or the thiosulfate ion. Another important reaction involves the oxidation of the methyl mercaptide ions in solution to form methyl disulfide. Certain metal salts such as those of iron, cobalt and manganese can act as catalytic agents in sulfide oxidation. Organic compounds in the liquor can also increase the rate of oxidation. The oxidation of weak black liquor positively prevents emission of hydrogen sulfide during multiple effect evaporation. If the liquor entering direct contact evaporator has been completely oxidized, the loss of hydrogen sulfide at this point can be reached to 0. Where the furnace emission of hydrogen sulfide had been reduced to 0 by appropriate operating adjustments, there was no detectable hydrogen sulfide in the stack gases when thoroughly oxidized black liquor was being processed in the direct-contact evaporator. Three general types of black-liquor-oxidation apparatus have been installed for full-scale plant operation: packed towers, bubble tray towers, and air-sparged reactors.

1965

35789 **APTIC NO. 58657**

Ambrose, Paul M.

SULFUR AND PYRITES. *Bull. Bureau Mines, no. 630:901-917, 1965. 21 refs.*

This review of the sulfur-producing industry includes the history of sulfur mining, the mining processes used, the geology of sulfur deposits, by-product recovery methods, and the economic aspects of sulfur mining. Sulfur production from sour natural, refinery, and industrial gases is becoming increasingly important in supplying world sulfur needs and in reducing air pollution. Dry processes used for removing hydrogen sulfide from the gas and recovering it in the elemental form include the iron-oxide process and the activated-carbon process. The iron-oxide process is the only dry process used extensively in the U. S. Wet processes, in which hydrogen sulfide is removed from the gas stream by scrubbing, utilize solutions that absorb H2S. The Gerbotol process is widely used for removal of H2S and carbon dioxide from gaseous mixtures; this process uses mono-, di-, and triethanolamines, which are stable and relatively nonvolatile. The Shell phosphate process is a regenerative liquid purification system used for the removal and recovery of H2S from sour natural or refinery gases and liquid hydrocarbons. The principal process used for recovering elemental sulfur from H2S is the modified Claus. There are two modifications of the Claus process--the partial-combustion process and the split-stream process.

1962

35790 **APTIC NO. 58653**

Markant, H. P., R. A. McIlroy, and R. E. Matty

ABSORPTION STUDIES, MGO-SO2 SYSTEMS. *TAPPI, 45(11):849-854, Nov. 1962. 10 refs.*

In view of the growth in the use of the magnesium pulping process, a series of pilot-plant investigations to determine the equilibrium vapor pressure of sulfur dioxide over various magnesium bisulfite solutions and to expand the study of the absorption mechanisms of interest was undertaken. Early investigations included the experimental determination of the vapor pressure of SO2 over magnesium bisulfite solutions and the study of the absorption mechanism. The purpose of this work was to provide accurate SO2 vapor pressure data and determine how the absorption is affected by magnesium monosulfite concentration. Other outputs from the investigation were the determination of the interrelationship of the variables involved in the absorption mechanism and the development of a general correlation of all data for the design of venturi gas absorbers. The effects of magnesium monosulfite in a pilot venturi absorption system was studied. The absorbing medium was a solution of magnesium bisulfite and magnesium monosulfite with a nominal 4% total SO2 acid. Increasing the MgSO3 concentration from 0.5% SO2 as MgSO3 to about 1% increased the venturi absorption efficiency by 15 to 20%. The effect of temperature on venturi absorption efficiency was small. For a temperature change from 110 to 170 deg F, the absorption efficiency decreased by 10% at 0.5% SO2 as MgSO3. Increases in acid strength for a given acid temperature and MgSO3 concentration gave rapid decreases in percentage of SO2 absorbed. These basic studies have increased the fundamental knowledge of absorption in the MgO-SO2 system.

1959

35791 **APTIC NO. 58652**

Kohl, A. L. and F. C. Riesenfeld

SULFUR DIOXIDE REMOVAL BY LIQUID ABSORPTION. *Chem. Eng., 66(12): 147-151, June 15, 1959.*

There are two processes for recovering sulfur dioxide via absorption in aromatic amines, the Sulphidine Process and the Asarco Process. In the first, the absorbent is a mixture of xylidine and water. Fumes are cleaned in a precipitator, then passed through two absorbers where they are contacted with the absorbent. Sodium carbonate in water is added periodically to the circulating stream in the second absorber. This is converted by free SO2 to sodium sulfite and carbon dioxide. Sodium sulfite combines with sulfate ions, and the resulting sodium sulfate is removed from the system with the waste water stream. In the Asarco Process, dimethylanilene is used instead of xylidine. Processes based on the absorption of SO2 by aqueous solutions of ammonia rely on steam or inert gas stripping, oxidation to sulfate, reduction to elemental sulfur, and replacement by a stronger acid. In the cyclic lime process, flue gas is washed with a slurry of calcium sulfate in water, kept alkaline by adding lime which reacts with the SO2 as it is absorbed. In the zinc oxide process, flue gases are contacted with a solution of sodium sulfite and bisulfite; the SO2 is absorbed to cause an increase in bisulfite content. Solution is next passed to a clarifier, where particulate matter removed from the gas stream is separated, and finally to a mixer where it is treated with ZnO. At this point, the original ratio of sulfite to bisulfite is restored, and zinc sulfite is precipitated. Another process is based upon absorption of SO2 in an aluminum hydroxide-sulfate solution and regeneration of the absorbent by heating.

1958

35792 **APTIC NO. 58651**

Kennaway, T.

THE FULHAM-SIMON-CARVES PROCESS FOR THE RECOVERY OF SULPHUR FROM FLUE GASES. *J. Air Pollution Control Assoc., 7(4):266-274, Feb. 1958. 9 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 50th, St. Louis, Mo., June 2-6, 1957.)*

A method of removing SO2 from flue gases so that ammonium sulfate crystals are formed is described. This process, called the Fulham-Simon-Carves Process, consists of scrubbing the flue gases with ammonia liquor to produce a solution of ammonium sulfate, sulfite, bisulfite, and thiosulfate. This solution can be converted by an autoclaving process to ammonium sulfate and sulfur. The liquor must be filtered before autoclaving or the sulfur produced will be only 96% pure.

1957

35793 **APTIC NO. 58727**

Field, J. H., L. M. Brunn, W. P. Haynes, and H. E. Benson

THE COSTS OF SCRUBBING OUT SO2 FROM FLUE GASES. *Combustion, 29(5):61-66, Nov. 1957. 10 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 50th, St. Louis, Mo., June 2-6, 1957.)*

Several methods of removing sulfur dioxide fom flue gases are discussed. The nonregenerative limestone process was the first non-effluent process used on a commercial scale to lower the SO2 content of flue gas to extremely low limits. In this process SO2 is removed from the gas by a neutralizing reaction with a slurry containing about 5 to 10% of limestone or lime. In the ammoniacal liquor process, the reaction of ammonia and SO2 in flue gas results in the formation of ammonium sulfate with small amounts of sulfite, bisulfite, and thiosulfite formed. The characteristic features of the sodium sulfite process are SO2 is removed from the flue gas by scrubbing with a sodium sulfite and bisulfite solution; a slurry of calcium sulfide is added to the spent solution to remove the sulfate ion by forming insoluble calcium sulfate; and after the spent solution is desulfated, it is treated with zinc oxide to form a solution of sodium sulfite and a precipitate of zinc sulfite. The capital requirements for a power plant burning coal would be increased 10 to 20% by the addition of scrubbing facilities. There are several ways to achieve cost reduction. One is the use of absorbents that are readily reactivated for use. The recovery of SO2 in a convenient form of sulfuric acid produciton, and the development of a single process for both purification and by-product recovery can reduce capital costs.

1881

35794 **APTIC NO. 58728**

Haeuisch, E. and M. Schroeder

THE RECOVERY OF SULFUROUS ACID FROM FURNACE GASES. *J. Soc. Chem. Ind., p. 570-571, Nov. 29, 1881.*

A process is described through which sulfur dioxide may be economically recovered using cold water as an absorbent. From the solution, the SO2 is again yielded on heating, with the requisite heat derived from a system of water regenerators. In a small experimental plant treating 50 cu m of water in 24 hours, over 99.5% of the gas dissolved in 97-98-deg water was regained. The gas contained 28% SO2. On a larger scale, complete recovery might be obtained at a lower temperature.

MEASUREMENT METHODS

1974

35795 **APTIC NO. 58902**

Berglund, B., U. Berglund, and T. Lindvall

MEASUREMENT OF RAPID CHANGES OF ODOR CONCENTRATION BY A SIGNAL DETECTION APPROACH. *J. Air Pollution Control Assoc., 24(2): 162-164, Feb. 1974. 8 refs.*

A sensory detection method based on signal detection theory is well suited for the measurement of rapid changes of odor concentration even at levels near the absolute threshold where sampling time makes physical-chemical methods of analysis impractical. Subjects were exposed to threshold dilutions of a factory effluent in an olfactometer located in a mobile laboratory, and the task involved discrimination of the low concentration odor from clean air. An index of detectability gave a clear picture of the concentration changes in an exposure hood after changes in dosing.

35796 **APTIC NO. 58960**

Bossart, Clayton J. and Albert A. Poli

APPARATUS FOR DETERMINING THE CARBON MONOXIDE, METHANE AND TOTAL HYDROCARBONS CONTENT IN AIR. *(Mine Safety Appliances Co., Pittsburgh, Pa.) U. S. Pat 3,790,348. 7p., Feb. 5, 1974. 4 refs. (Appl. March 22, 1972, 8 claims).*

An air sample to be analyzed for carbon monoxide and methane is delivered to a chromatograph column that is connected by a reactor with a hydrogen flame ionization detector. The reactor converts CO in the sample into CH4. The amount of CO and CH4 in the sample is determined by measuring the electrical conductivity of the detector. To measure total hydrocarbons in the impure air being sampled, a stream of the sample air is delivered to a conduit communicating with the detector. When total HCs are not being detected, a stream of pure air is delivered to the conduit continuously to establish a reference point for the analyses. Errors caused by variations in the oxygen content of the sample air are avoided by establishing and maintaining a zero level or reference for the reading. This is accomplished by eliminating the second sample valve and delivering pure air to the hydrogen flame ionization detector at all times except when impure air is being analyzed for total HC.

35797 **APTIC NO. 59335**

DeLong, H. P.

AIR POLLUTION FIELD STUDIES WITH A RAMAN LIDAR. *Opt. Eng., 13(1):5-9, Jan.-Feb. 1974. 15 refs.*

The experimental results obtained with the Edgewood Raman Lidar and those obtained by others indicates this technique is potentially a very useful tool is pollutant monitoring. The device offers the capability of monitoring pollutants from ranges in excess of 400 m plus potentially allowing three-dimensional tracking of a pollutant cloud. Before Raman Lidar becomes a technique readily available for routine analysis or for spot checking of potential pollution sources, a number of advances must be made in instrumentation and electron-optics. Raman Lidar techniques have been discussed theoretically and sensitivities for various pollutants have been predicted. The results of the present real Raman Lidar indicates pollutant levels between 40-700 ppm in the present sensitivity but very realistic projections based on this data suggest sensitivities between 0.4-7 ppm could be reached if nondispersive detection techniques were used. Some of the pollutants considered are nitrogen, oxygen, carbon monoxide, carbon dioxide, nitric oxide, nitrous oxide, sulfur dioxide, methane, hydrogen sulfide, ammonia, chlorine, ethane, and hydrogen.

35798 **APTIC NO. 59310**

Deshpande, J. M.

X-RAY FLUORESCENCE - AN INTERNATIONAL CALIBRATION METHOD. *Experientia Suppl. no. 20:139-143, 1974. 6 refs.*

The advantages in adopting the x-ray fluorescence method as an international calibration method, particularly for the estimation of sulfur dioxide and particulate matter, are cited. The method is free from all of the problems associated with wet chemical methods such as evaporation of solutions (in tropical countries), freezing of solutions (in temperate countries), or spilling; its simplicity results in fewer experimental errors. The method could be used to calibrate other instruments against itself rather than the employment of x-ray fluorescence spectrometer systems at each monitoring location. Examples are given of its successful application to the measurement of sulfur dioxide (2-500 micrograms) and its extension down it the 0.1 microgram level.

35799 **APTIC NO. 59153**

Frukht, I. A. and V. G. El yanov

AIR SAMPLING PROCEDURE FOR ANALYZING OIL AEROSOLS. *(O metodike otbora prob vozdukha dlya analiza soderzhaniya v nem maslyanogo aerozolya). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 1:47-48, 1974.*

Simple method for the sampling of air around machine tools for the determination of cutting oil aerosol concentrations is described. Air samples are taken by means of a vaccumized pipette for subsequent determination of the aerosol content. Air sampling has definite advantages over filter sampling because it allows the determination of instantaneous values for aerosol concentrations during the individual phases of the machine tool operation. The actual aerosol concentration differed from the calculated value by 8.4% in an experiment.

35800 **APTIC NO. 59320**

Guedalia, D., C. Allet, and J. Fontan

VERTICAL EXCHANGE MEASUREMENTS IN THE LOWER TROPOSPHERE USING THB (PB-212) AND RADON (RN-222). *J. Appl. Meteorol., 13(1):27-39, Feb. 1974. 33 refs.*

Various methods of determining vertical eddy diffusion coefficients in the planetary boundary layer from two natural radioactive tracers, radon (Rn-222) and ThB (Pb-212), are presented and discussed. In all cases, it is more pertinent to measure vertical exchanges in the lower atmosphere using ThB (10.6 hr half-life) than Rn (3.8 days half-life). About 30 vertical profiles of Rn and ThB in the lower troposphere (100-3000 m) are determined over a 12-month period. Vertical eddy coefficient values are calculated according to the various methods discussed. The variation range, between 0.1 and several 100 sq m/sec, is large and closely related to the vertical temperature gradient variation. Low values .01 to 0.1 sq m/sec of the exchange coefficients determined in the inversion layer which frequently exists at the top of the planetary boundary layer show that vertical turbulent fluxes toward the free atmosphere are relatively small. (Author abstract)

35801 **APTIC NO. 58495**

Haenel, Gottfried and Gode Gravenhorst

JET IMPACTOR CHARACTERISTICS VERSUS RELATIVE HUMIDITY. *J. Aerosol Sci., 5(1):47-54, Jan. 1974. 13 refs.*

Increased relative humidity can increase particle size and thus affect the collection of aerosols by jet impactors. For six types of continental and marine aerosols, the cut-off radius and the number of particles collected within a jet impactor were calculated as a function of relative humidity. The six aerosol types were an average aerosol from Mainz Germany, a sea-spray aerosol, aerosol over the Atlantic, aerosol from Sahara dust over the Atlantic, urban aerosol from Mainz, and aerosol at a mountain in Germany. The calculations were performed for a three-stage impactor and for several heights above the mean sea level. An increase of the cut-off radius occurred on approximately a factor of 1.5-2 with a relative humidity between 0 and 0.995. For each stage, the number of collected particles per cu of ambient air was not influenced severely, as long as the relative humidity was below 0.7. At larger humidities, this number increased strongly with relative humidity in most cases. The theoretical basis for the calculations was the implicit formula for the appropriate inertia parameter which is closely related with the probability of a particle being collected. (Author abstract modified)

35802 **APTIC NO. 58987**

Haley, Floyd C.

GAS ANALYSES SYSTEMS AND PALLADIUM TUBE SEPARATOR THEREFORE *(California Inst. of Tech.) U. S. Pat. 3,791,106. 7p., Feb. 12, 1974. 8 refs. (Appl. Sept. 24, 1970, 2 claims).*

Sequential analytical determination of the composition of a vapor sample is performed by suspending the sample in a major amount of hydrogen carrier gas or mixed carrier gas consisting of H2 and helium and passing the suspension through a gas chromatograph. More than 90% of the H2 carrier gas is removed from the effluent of the chromatograph by passing the effluent through a heated palladium tube which is selectively permeable to H2 before delivering to a detector such as a mass spectrometer. Removal of the H2 portion of the carrier gas through the wall of the tube may be enhanced by providing an oxygen-containing atmosphere at the outside surface of the tube. (Author abstract)

35803 **APTIC NO. 59332**

Heindryckx, R. and R. Dams

EVALUATION OF THREE PROCEDURES FOR NEUTRON ACTIVATION ANALYSIS OF ELEMENTS IN ATMOSPHERIC AEROSOLS USING SHORT-LIVED ISOTOPES. *Radiochem, Radioanal. Lett., 16(4):209-225, Feb. 1974. 7 refs.*

Three different short procedures for neutron activation trace analysis of ambient aerosol samples, collected on cellulose filters, and proposed. In all three procedures a flux monitor is used and the samples are irradiated and counted following a rigid scheme, of respectively 40, 19, and 20 min. The results obtained by the three methods for the elements sodium, aluminum, chlorine, vanadium, manganese, calcium, and bromine are compared. The reproducibilities are generally better than 10% and the results from the three methods agree within the standard deviations. (Author abstract)

35804 **APTIC NO. 59299**

Hicks, Jackson E., James E. Fleenor, and Harold R. Smith

THE RAPID DETERMINATION OF SULFUR IN COAL. *Anal. Chim. Acta, 68(2):480-483, Feb. 1974. 6 refs.*

Data are presented to indicate the satisfactory determination of sulfur in coal by combustion and subsequent automatic titration of the bomb-washings with lead perchlorate solution and a lead-selective electrode. A determination of the bomb-washings is attractive insofar as it simultaneously enables a determination of calorific value, and the use of a recording titrator and an ion-selective electrode provides the rapidity and precision desired. Air should not be flushed from the bomb during pressurization with oxygen and a double-junction reference electrode should be used. The electrode surface usually requires cleaning with an abrasive after 10-15 titrations. Ten determinations of sulfur in a typical coal by the proposed potentiometric method gave an average value of 0.79% S with a standard deviation of 0.027%.

35805 **APTIC NO. 59336**

Hirschfeld, Tomas B.

LONG PATH INFRARED SPECTROSCOPIC DETECTION OF ATMOSPHERIC POLLUTANTS. *Opt. Eng., 13(1):15-18, Jan.-Feb. 1974. 8 refs.*

Long path infrared spectroscopy of air pollutants is operationally classified into several system types: long folded path samplers, two station remote instruments using either a remote source or a remote retroreflector, and one-station remote instruments using either natural sources, laser backscatter, remote fluorescence, or passive measurement of sample thermal emission. The operational requirements of each system are described, as are their advantages, disadvantages, and one example each of their results. A comparison of their overall performance reveals that the best system now available would be a two-station remote device with an array of distal retroreflectors, employing a correlation Fourier Transform Spectrometer as a receiver. The main application of such a system would be the detection of widely dispersed pollutants at extremely low concentrations. (Author abstract)

35806 **APTIC NO. 59064**

Hrubesh, L. W.

A SIMPLIFIED MICROWAVE INSTRUMENT FOR MEASURING PARTICLE VOLUMES AND DENSITIES. *Rev. Sci. Instr., 45(1):125-126, Jan. 1974. 5 refs.*

A simplified microwave instrument is described for the direct and simple measurement of small particle volume and density. Volumes of 150 micron glass spheres were measured. The technique is applicable to particles as small as 50 micron. The instrument uses microwave spectroscopy. (Author abstract modified)

35807 **APTIC NO. 59009**

Kaiser, Rudolf E.

GAS CHROMATOGRAPHY IN ENVIRONMENTAL ANALYSIS. *J. Chromatographic Sci., 12(1):36-39, Jan. 1974. 9 refs. (Presented at the Summer Symposium on Analytical Chemistry, American Chemical Society, Oxford, Ohio, June 13-15, 1973.)*

Possibilities and limitations of gas chromatography in environmental analysis are examined. Trace gas chromatographic methods offer possibilities to: pick out and quantitatively measure without calibration a single specific compound with hardly any doubt that the compound really is a chemically pure species; deal with enough information about a possible systematic error of the quantitative results; and produce complex fingerprints with a very high content of information at a very good level of repeatability at a concentration level of 10 to the minus 10% (0.001 ppb). These possibilities, however, are limited to compounds which are chemically and physically stable under gas chromatographic conditions or which can be thermally decomposed reproducibly and which have a high enough vapor pressure. At least 100,000 compounds can be present at a concentration level of 10 to the minus 10%; and, thus, an analytical result about a chemical species can be obtained only by a combination of specific enrichment at the source of the sample plus specific elution and transfer to a specific separation column coupled with one, or preferably two, specific detectors under careful quantitative conditions. Specificity in gas chromatography, particularly in ultratrace analysis, can be achieved by using two-dimensional systems and by using columns with the highest possible separation power.

35808 **APTIC NO. 58470**

Kreuzer, L. B.

LASER OPTOACOUSTIC SPECTROSCOPY--A NEW TECHNIQUE OF GAS ANALYSIS. *Anal. Chem., 46(2):235-243, Feb. 1974. 10 refs.*

A technique of laser optoacoustic spectroscopy for gas analysis which uses infrared light is described. It can automatically analyze a mixture of gases with high rejection ratios and sensitivity. One particularly promising field of application is gaseous air pollution detection, where a single laser optoacoustical system can replace the collection of single gas analyzers which are currently required to provide a complete analysis of ambient air. Several laser systems and the design and operation of the laser optoacoustic spectrometer are described. The spectrometer gas analyzer was tested by measuring ammonia, ethanol, ethylene, methanol, and trichloroethylene and comparing their spectra with the absorption spectra from a carbon dioxide laser. Interference of compounds on the analysis of gases is discussed. A DIAX Model 100 gas analyzer was developed using the laser optoacoustic spectrometer technique tested in the prototype system. Unlike the prototype system which could only detect gases that absorb in the 9.2 to 10.8 micron region, the Model 100 can produce over 200 different wavelengths over the 2-11 micron region.

35809 **APTIC NO. 58788**

Leschonski, K., W. Alex, and B. Koglin

PARTICLE SIZE ANALYSIS. 1. REPRESENTATION AND EVALUATION OF PARTICLE SIZE DISTRIBUTIONS. *(Teilchengroessenanalyse. 1. Darstellung und Auswertung von Teilchengroessenverteilungen). Text in German. Chem.-Ingr.-Tech., 46(1):23-26, 1974. 3 refs.*

The range of linear dimensions of disperse elements which can be determined with statistical particle size analysis starts at 0.01 to 0.1 micron and ends at particles sizes of several cm and more. For characterization of an individual element, its physical properties are used such as mass, volume, surface, settling velocity in a gas or liquid, intensity of light scattering, or absorption or interference with an electric field. The particles which have the same physical properties can be either counted or weighed. A graphical illustration of particle size distribution, the definition of complete and incomplete moments, and the calculation of moments from optional or measured distributions are reviewed.

35810 **APTIC NO. 58473**

Marple, Virgil A., Benjamin Y. H. Liu, and Kenneth T. Whitby

FLUID MECHANICS OF THE LAMINAR FLOW AEROSOL IMPACTOR. *J. Aerosol Sci., 5(1):1-16, Jan. 1974. 31 refs.*

The aerosol impactor, an inertial device for collecting airborne particles, is widely used for gravimetric, chemical, and similar analyses of airborne particulates. The fluid mechanics of laminar flow aerosol impactors of both rectangular and round geometry were studied theoretically and experimentally. Streamlines in a rectangular impactor were obtained theoretically by solving the Navier-Stokes equations on a computer. The results were in good agreement with experimentally generated streamlines in a water model using an electrolytic flow visualization technique. Further theoretical studies of the impactor using the computer solution technique showed that the flow field in the impaction region above the impaction plate was influenced only to a very limited extent by the impactor throat length, while the effect due to variations in the jet-to-plate distance and the jet Reynolds number was somewhat larger. The boundary layer thickness along the impaction plate was nearly constant, but the thickness was dependent on the jet Reynolds and number and was affected to a very slight extent by the jet-to-plate distance. (Author abstract modified)

35811 **APTIC NO. 59063**

Nader, John S.

STATUS OF SOURCE MEASUREMENT TECHNIQUES IN THE UNITED STATES. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, 21p., 1974 (?). 11 refs.*

Measurement requirements for emissions from stationary sources as specified in Federal government regulations are identified. The regulations include New Source Performance Standards, National Emission Standards for Hazardous Air Pollutant Substances, and State Implementation Plans. The measurement requirements consist of compliance test methods and continuous monitoring systems applicable to gases, particulates, and hazardous substances. Source industries and their emissions subject to regulations to date are presented. Developments in measurement techniques are discussed with attention directed to various sampling schemes, namely, extractive, in-situ, and remote. Performance parameters of monitoring systems for gases and visible emissions are identified. Performance specifications under development are briefly summarized. Source sampling, sampling interfaces, gaseous measurement instruments, status of instrument development for particulates, and specifications for transmissometer systems are also mentioned. (Author abstract modified)

35812 **APTIC NO. 59301**

Nand, Sachchida and M. K. Sarkar

ONE-STEP ANALYSIS OF A MIXTURE OF PERMANENT GASES AND LIGHT HYDROCARBONS BY GAS CHROMATOGRAPHY. *J. Chromatog., 89(1):73-75, 1974. 11 refs.*

The development of an analytical technique is described for mixtures of permanent gases and light hydrocarbons with a single sample injection using hydrogen as the carrier gas and without the use of any sub-ambient temperature programming. A Perkin-Elmer (Model 900) chromatograph was modified and two standard Poropak Q columns were fitted inside the programmed oven of the dual column chromatograph. Initially, the Poropak and molecular sieve columns were arranged in series, and nitrogen, oxygen, methane, and carbon monoxide were allowed to leave the first column (50 degrees) and enter the second. Then the molecular sieve was by-passed and carbon dioxide and hydrocarbons were allowed to leave the first column with temperature programming and pass into the detector. Subsequently, the effluent from the first column was again allowed to pass through the molecular sieve so as to separate N2, O2, methane, and CO. The time required for a complete analysis was about 30 min.

35813 **APTIC NO. 59344**

Natusch, D. F. S., J. R. Sewell, and R. L. Tanner

DETERMINATION OF HYDROGEN SULFIDE IN AIR--AN ASSESSMENT OF INPREGNATED PAPER TAPE METHODS. *Anal. Chem., 46(3):410-415, March 1974. 21 refs.*

The collection of hydrogen sulfide on paper tapes impregnated with silver nitrate, dicyanoargenate(I), mercuric chloride, or lead acetate followed by optical density determination of the metal sulfide formed appears to offer considerable advantage as a routine, general purpose method for the determination of H2S in air. A variety of parameters, including tape preparation, air flow rate, H2S concentration, relative humidity, light, and the presence of interfering gases, were investigated to determine their effects on H2S collection efficiency and the stability of the collected sulfide for each impregnating reagent, and tapes impregnated with silver nitrate were found highly suitable for determination of H2S concentrations in the range of 0.001-50 ppm. The method is simple, specific, portable, capable of unattended operation, and inexpensive and is highly recommended for both laboratory and field operation. (Author abstract modified)

35814 **APTIC NO. 58855**

Renoux, A., G. Tymen, and G. Madelaine

EXPERIMENTAL DETERMINATION OF THE CHARACTERISTICS OF THE CASELLA MK2 CASCADE IMPACTOR. APPLICATION TO THE STUDY OF THE GRANULOMETRIC DISTRIBUTION OF AEROSOLS AND OF ATMOSPHERIC RADIOACTIVITY. *Atmos. Environ., 8(1):41-55, Jan. 1974. 20 refs.*

The different characteristic diameters (cut-off size, effective cut-off size, mass median diameter, and effective cut-off diameter) of a Casella MK2 cascade impactor were experimentally determined by tracing the penetration curves of the apparatus. On the second and third discs the distribution of dust is log normal. Evaluating the law of granulometric distribution of aerosols, i.e., dN/(d logR) equals CR to the minus B power gives the solution B equals 2.3 for 0.2 micron is less than R is less than 2 micron; B equals 3.4 for 2 micron is less than 20 micron; and B equals 6.5 for R greater than 20 micron. The experimental values of the mean mass diameter and the effective cut-off diameter measured for each stage of the cascade impactor are used to correct the cumulated distribution curves of the mass and of the natural radioactivity of the atmospheric aerosols. (Author abstract)

35815 **APTIC NO. 58908**

Rothe, K. W., U. Brinkmann, and H. Walther

APPLICATIONS OF TUNABLE DYE LASERS TO AIR POLLUTION DETECTION: MEASUREMENTS OF ATMOSPHERIC NO2 CONCENTRATIONS BY DIFFERENTIAL ABSORPTION. *Appl. Phys., 3(2):115-119, Feb. 1974. 12 refs.*

The application of a light detection and ranging (lidar) system equipped with a tunable dye laser to remote measurement of atmospheric nitrogen dioxide concentrations is illustrated with data obtained over the city of Cologne. Concentration values of about O.2 ppm NO2 were detected over the city at distances up to 4 km, using the differential absorption method. The measurements indicated that such a method is feasible in the case of NO2 and that a daylight measurement of NO2 should be achievable with a higher laser power and smaller bandwidth of the receiving system. Extension of the method to other pollutants appears desirable, the most promising spectral region for this purpose being the infrared. (Author abstract modified)

35816 **APTIC NO. 58965**

Schmidt, Ulrich

GAS TURBIDITY MEASURING APPARATUS. *(Robert Bosch GmbH, Stuttgart (Germany)) U. S. Pat. 3,790,289. 6p., Feb. 5, 1974. 1 ref. (Appl. Feb. 5, 1973, 29 claims).*

The turbidity of exhaust gases of an internal combustion engine is measured by comparing light transmission through the gases with light transmission through an equivalent body of clean air. In order to prevent accumulation of dirt or soot on the light source, photocell, and optical path element, a pair of transparent rotating discs is used to close off the opening through which light enters and leaves the test chamber, allowing a small gap for a laminar boundary layer of clean air. One the discs has opaque sections and functions also as a shutter so that the light may pass alternately through the test chamber and through another chamber containing clean air. Measurement errors caused by efforts to keep the light source clean, temperature and pressure variations, and reflections are avoided.

35817 **APTIC NO. 59324**

Schotland, Richard M.

ERRORS IN THE LIDAR MEASUREMENT OF ATMOSPHERIC GASES BY DIFFERENTIAL ABSORPTION. *J. Appl. Meteorol., 13(1):71-77, Feb. 1974. 25 refs.*

An analysis is presented of the lidar measurement of the distribution of atmospheric gases by the differential absorption of scattered energy. The error involved in the measurement of the spatial distribution of the gas density is investigated in terms of the uncertainties associated with the absorption coefficient, the power measurement, the atmospheric parameters, and the laser frequency. An application of the error analysis is made to the measurement of the density of water vapor by a ruby lidar tuned to the 694.38-nm line of water vapor. The uncertainty in the measurement of water vapor is governed by instabilities in the laser frequency for observations below 2 km. At greater altitudes, the uncertainty in the measurement of the density arises from the variance associated with the power measurement. The fractional standard deviation of the water vapor measurement is less than 6% for altitudes below 3 km for the distribution of water vapor studied. (Author abstract)

35818 **APTIC NO. 59330**

Shilman, Avner

THE ANALYSIS OF TRACE AMOUNTS OF CARBON MONOXIDE. *Environ. Letters, 6(2):149-150, 1974. 2 refs.*

Carbon monoxide in amounts of 1 times 10 to the minus 10th to 5 times 10 to the minus 9th moles have been analyzed for by means of a specially constructed gas chromatograph employing a suitable sampler, molecular sieve column, and a glow discharge detector. The apparatus consisted of two main parts; a sampler, into which the contents of the mixture were transferred and diluted with nitrogen on one atmosphere, and a gas chromatograph, which contained a six-foot column of 5x molecular sieve. The column was specially conditioned by first heating the molecular sieve at 100 C for 2 hr, then introducing it into the column and passing acetone vapor through it for 1 hr. With this treatment CO appears after 5 min at a flow rate of 100 cc/min of N2. The column and the reference column led into a pair of glow discharge detectors, which were constructed from OB-2 vacuum tubes by replacing the external glass cover with a suitable glass envelope with conduit for in and out-flow of gas. The electronic circuit, a high impedance cathode follower, consisted of a simple bridge design.

35819 **APTIC NO. 58478**

Siemer, Duane, Jerome Lech, and Ray Woodriff

APPLICATION OF CARBON ROD ATOMIZER FOR THE ANALYSIS OF MERCURY IN AIR. *Appl. Spectry., 28(1):68-71, Jan./Feb. 1974. 12 refs.*

The application of the carbon rod atomizer to the analysis of mercury in airborne particulates was studied. The mercury is trapped by a tube of porous graphite filter. Then the tube is placed into the carbon rod atomizer, and the mercury is driven off directly into the light path of an atomic absorption spectrophotometer, which meausres absorption of the mercury 2537 A line. The efficiency of mercury removal from saturated air at 24 C was studied with various tubes. The reproducibility of the analytical process was also measured. This technique of measuring mercury in air is both simple and quick. The sensitivity of the method of analysis is 3 times 10 to the -10th power g (1% absorption). The detection limit in terms of the lowest concentration detectable in air depends on the volume of air sampled. An air sample of 50 cc is more than sufficient to establish whether mercury is at a dangerous level or not.

35820 **APTIC NO. 58451**

Smutek, M. and J. Pich

IMPACTION OF PARTICLES ON THE SURFACE OF MEMBRANE FILTERS. *J. Aerosol Sci., 5(1):17-24, Jan. 1974. 6 refs.*

A simple treatment of low-speed fluid flow in the capillary model of a membrane filter is suggested. Using this model, and solving appropriate hydrodynamic equations, the velocity field in this system was calculated and the inertial deposition of monodisperse, spherical particles on the surface of the membrane filter was investigated. By solving the corresponding motion equations of the particles, an appropriate expression for the efficiency of surface retention of particles by the filter was derived. The theory takes into account the finite size of depositing particles. Derived equations are analyzed and the limitations of the model are discussed. (Author abstract)

35821 **APTIC NO. 58730**

Stevens, Robert K., Thomas Clark, Ralph Baumgardner, and J. A. Hodgeson

INSTRUMENTATION FOR THE MEASUREMENT OF NITROGEN DIOXIDE. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., 16p., 1974 (?), 9 refs.*

The operational and response characteristics of colorimetric, chemilumescent, and electrochemical monitors for ambient nitrogen dioxide are discussed. Details of recent studies which demonstrate that ozone is a significant negative interference with the automated colorimetric techniques presented. The latest technology for the conversion of NO2 to nitric oxide for subsequent chemiluminescent detection is discussed. The reduction of NO2 at temperatures lower than 600 C, where no oxidation of ammonia occurs, is the method commonly being used today for eliminating the NH3 interference. The use of carbon is a workable approach for the specific redox conversion of NO2. Quantitative conversion of NO2 can be effected at 200 C, and thus the self-consumption of C is minimized. Typically C-based converters maintain an efficiency above 92% for at least 4 mo. The electrochemical techniques for the measurement of NO2 are accomplished with a sealed faradaic device in which an electroreduction of absorbed NO2 molecules occurs at a sensing electrode. This results in a current directly proportional to the partial pressure of the NO2 in the sample flowing over a semi-permeable membrane that separates the electrolyte from the air stream. Hydrogen sulfide interferes with the selective sensing of NO2, and a silver scrubber may be used to eliminate the H2S interference. The approximate life of the Ag scrubber is 4 mo when 50 ppb of H2S are continuously passed through it. (Author abstract modified)

1973

35822 **APTIC NO. 58344**

Adamiak-Ziemba, Janina

USE OF COLORIMETRIC METHODS OF CYCLOHEXANON AND CYCLOHEXANOL SEPARATE DETERMINATION FOR THE EVALUATION OF COMPLEX INDUSTRIAL EXPOSURE. *(Zastosowanie kolorymetrycznych metod oznaczania cykloheksanonu i cykloheksanolu w ocenie zlozonego narazenia w przemysle). Text in Polish. Med. Pracy (Warsaw), 24(1):59-69, 1973. 13 refs.*

Methods for separate determination of phenol, cyclohexanon, and cyclohexanol in the air were investigated for the evaluation of complex exposure at caprolactam-producing plants. The following methods were examined: phenol, reaction with paranitroaniline, cyclohexanol, reaction with diphenyloamine, and cyclohexanon, reaction with furfurol. The sensitivity was sufficient and equaled 5 mg/cu m (1/4 of the maximum allowable concentration value) for cyclohexanon and 2 mg/cu m (1/10 of the MAC value) for cyclohexanol. Cyclohexanone can be determined in cyclohexanon at the concentration of 50 mg/cu m and cyclohexanon can be measured in the presence of cyclohexanol at a concentration of 20 mg/ cu m. The results are not affected by phenol. The MAC values were not exceeded at any of the caprolactam plants.

35823 **APTIC NO. 58401**

Amaya, Kazuo

ON THE SIMPLE NO2 POLLUTION ALARM. *(Kani NO2 keihoki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):405, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 142.)*

The present system of nitrogen dioxide monitoring is extremely unsatisfactory. After examining various methods, a method of issuing an automatic alarm by the combination of colorimetry using Saltzman reagent with coulometry was considered. By creating the same color in another cell by automatic electrolysis, when the level of electric output reaches a certain point, the alarm is set automatically.

35824 **APTIC NO. 58556**

Aoki, Toyoaki, Yasuaki Maeda, and Makoto Munemori

INTERFERENCE OF OTHER POLLUTANTS IN THE PARAROSANILINE FOR AMBIENT FORMALDEHYDE. *(p-Rozanirin-ho ni yoru taikichu no horumuarudehido no teiryo ni taisuru ta no osen busshitsu no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):601, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 322.)*

Formaldehyde was captured from the air by an impinger and quantitated by the pararosaniline method. Collection efficiency of the impinger was 65-75%. The presence of nitrogen dioxide did not affect the measurement of formaldehyde, but a great quantity of sulfur dioxide decreased the absorption rate. The coexisting formic acid, acetone, and ethanol in the absorbent up to 0.5% did not affect the measurement at all. The presence of crotonaldehyde and benzaldehyde in great quantities did not affect the measurement, but acrolein and acetaldehyde increased the absorption if they coexisted in quantity. A photochemical test was given to hydrocarbons by adding NO2, SO2, and irradiating the mixture by blacklight. The amount of aldehyde formation was such greater with the presence of butadiene, starting with 87 ppm; toluene, and n-hexane did not form aldehyde until 1000 ppm. When SO2 was present in the reaction chamber, the time for reducing formaldehyde was shortened.

35825 **APTIC NO. 58385**

Appel, B. R.

A NEW AND MORE SENSITIVE PROCEDURE FOR ANALYSIS OF PEROXYBENZOYL NITRATE. *J. Air Pollution Control Assoc., 23(12):1042-1044, Dec. 1973. 5 refs.*

The development and application of a new and more sensitive procedure for analysis of peroxybenzoyl nitrate (PBzN) are described. The procedure involves quantitative conversion of PBzN to methyl benzoate (MeOBz) by trapping the compound in basic methanol solution followed by Gas Liquid Chromatography Flame Ionization Detection determination of the MeOBz. By employing this method, the formation of PBzN from laboratory irradiation of toluene-nitrogen oxides in the air was demonstrated and quantitatively determined. The absence of PBzN formation from o-xylene and i-propylbenzene was confirmed. The technique has, in principle, unlimited sensitivity. Preliminary atmospheric sampling trials in the San Francisco Bay area demonstrated that, if PBzN were present, its concentration was equal to or less than 0.07 ppb. (Author abstract modified)

35826 **APTIC NO. 59201**

Appel, B. R., J. J. Wesolowski, E. Hoffer, S. Twiss, S. Wall, and T. N. Novakov

VALIDATION OF ELECTRON SPECTROSCOPY CHEMICAL ANALYSIS (ESCA) OF ATMOSPHERIC PARTICULATE MATTER SAMPLES. *California Dept. of*

Public Health, Berkeley, Air and Industrial Hygiene Lab., AIHL Rept. 155, 22p., Oct. 1973. 12 refs.

Electron spectroscopy chemical analysis (ESCA) was compared with wet chemical and other analytical techniques in analyzing urban atmospheric aerosols. The The comparison demonstrated agreement within about a factor of two for sulfate and carbon, but gave much larger deviations for nitrate and ammonium. Two possible causes of the differences in ammonium analysis are loss of volatile ammonium salts under ESCA conditions and amine interference in the wet chemical procedure giving erroneously high values. Loss of volatile nitrates under ESCA analysis conditions remains the most likely explanation of the large discrepancy in nitrate analysis. (Author summary modified)

35827 **APTIC NO. 58816**

Araki, Shun

TECHNIQUE OF MEASUREMENT OF NOX. *(NOx no sokutei gijutsu ni tsuite). Text in Japanese. Kankyo Sozo (Environ. Creation), 3(12):74-80, Dec. 1973.*

Analytical and measurement techniques for nitrogen oxides in stack gases are reviewed. The phenoldisulfonic acid method is efficient for large concentrations of NOx. The ion-electrode method is efficient at a concentration of 50-1500 ppm NOx. The Saltzman method is most efficient at concentrations of 10-1000 ppm, and the zinc-reduction Saltzman at 50-500 ppm. Ultraviolet and infrared spectrometry are efficient for concentrations between 0-10,000, but interference by carbon dioxide and water is common. Electrochemical methods are used for 0-1000 ppm NOx.

35828 **APTIC NO. 58718**

Baldeck, Charles, G. William Kalb, and Howard L. Crist

DETERMINATION OF ELEMENTAL MERCURY IN AN EMISSION SOURCE HAVING A HIGH SULFUR DIOXIDE CONCENTRATION BY AMALGAMATION WITH GOLD AND ULTRAVIOLET SPECTROPHOTOMETRY. *Preprint TraDet Inc., Columbus, Ohio and Environmental Protection Agency, Research Triangle Park, N. C., Monitoring Lab., 31p., 1973. 18 refs.*

Gold is described as a collection medium for the quantitative separation of elemental mercury from stack gases in the presence of 6-8% sulfur dioxide. A slightly modified Environmental Protection Agency sampling train with impingers altered to hold 20-30 gm of gold chips was used. The gold amalgam was heated in an induction coil and the liberated mercury was absorbed in 3% potassium manganate solution; particulates on the filter were digested in nitric acid. Both solutions were reduced and aerated, and the absorbance was measured at 253.7 nm by an ultraviolet spectrophotometer. Collection of mercury on gold eliminates several interferences such as SO2, hydrogen sulfide, and organic substances which may be present in stack gases and react with liquid absorbing reagents inhibiting their quantitative retention of mercury. The collection efficency of the filter and amalgamators was, for most runs, in excess of 95%. The retention of mercury on three gold amalgamators between the sampling rates of 0.3 and 0.7 cu ft/min was well above 95% at sampling times of 5, 10 and 15 minutes. (Author abstract)

35829 **APTIC NO. 58436**

Barrett, D. F. and J. R. Small

EMISSION MONITORING OF SO2 AND NOX. *Chem. Eng. Progr., 69(12):35- 38, Dec. 1973. 3 refs.*

The performance of analyzers for emission monitoring of sulfur dioxide and nitrogen oxides is evaluated. Instruments employing ultraviolet or visible photometric measurement principles and sample systems have been successfully used in a number of plants. Pertinent performance data are listed for process type, calibration, length of instrument operation, malfunctions, and required maintenance time. The estimated downtime by users was 1% for a nitric acid plant and less than 1% for five other plants over a 1 1/2 yr to 2 1/2 yr period. Photometric analyzers and a careful design of a sample system are effective in the measurement of SO2 and NOx.

35830 **APTIC NO. 58794**

Benaim, Carlos

STAINING OF BIOLOGIC AIRBORNE PARTICLES CAUGHT WITH THE ROTOROD SAMPLER. *Ann. Allergy, 31(12):618-620, Dec. 1973. 5 refs.*

The rotord sampler has been used to collect fluorescent tracer material, and with the use of I rods, pollen, spores, and other airborne elements. When these particles are examined under the microscope, light diffraction can cause distortion of images, unless the particles are stained. A modified rotorod sampler is described with the I rods placed 1/128th inch under the level of the adapter. The spaces are filled with a staining fluid which can improve microscopic examination of particles, particularly pollen and spores.

35831 **APTIC NO. 59254**

Bortner, M. H., R. Dick, H. W. Goldstein, R. N. Grenda, and G. M. Levy

DEVELOPMENT OF A BREADBOARD MODEL CORRELATION INTERFEROMETER FOR THE CARBON MONOXIDE POLLUTION EXPERIMENT. *General Electric Co., Philadelphia, Pa., Valley Forge Space Center, NASA Contract NAS1-10139, 186p., March 1973. 12 refs.*

A breadboard model of a correlation interferometer for a carbon monoxide pollution experiment was designed and fabricated; and laboratory, long-path, and atmospheric tests demonstrated the technique to be a feasible method for obtaining a global carbon monoxide map and a vertical CO profile. The technique is also readily applicable to other trace gases such as methane if minor instrumental changes are made. Carbon monoxide and CH4 data can be obtained with an accuracy of 10% using the technique on a spectral region around 2.3 micron. Outdoor tests showed that the effect of atmospheric amounts of water can be overcome by a proper choice of correlation functions. (Author abstract modified)

35832 **APTIC NO. 58453**

Carroll, H. B., Jr., R. M. Ray, and F. E. Armstrong

CONTROLLED-ATMOSPHERE SYSTEM FOR TESTING GAS MONITORS. *Bureau of Mines, Bartlesville, Okla., Bartlesville Energy Research Center, RI 7889, 13p., 1973. 11 refs.*

A controlled-environment test chamber was built specifically for instrument evaluation in simulated work atmospheres. The atmosphere inside the 300-liter stainless steel chamber can be controlled at any selected temperature and relative humidity in the range of 2-93 C and 20-95%, respectively. Instruments placed inside the test chamber are subjected to an atmosphere containing various concentrations of toxic gases such as carbon dioxide, carbon monoxide, nitric oxide, nitrogen dioxide, sulfur dioxide, and hydrogen sulfide. Toxic gas losses resulting from wall reactions, monitoring instruments, and instruments under evaluation are compensated by use of a dynamic gas blending system. (Author abstract modified)

35833 **APTIC NO. 58923**

Carroll, H. B., Jr. and R. M. Ray

EVALUATION OF INSTRUMENTATION FOR MEASURING BEHAVIOR OF AEROSOLS IN SMOG-CHAMBER STUDIES. *Bureau of Mines, Bartlesville, Okla., Bartlesville Energy Research Center, RI 7818, 27p., 1973. 21 refs.*

The adaptability of a nephelometer and a smokemeter were investigated in an effort to evaluate their use in routine, analytical smog-chamber experiments and to compare their responses to aerosol during the experiments. Both instruments sampling systems were modified; smaller size sample input systems were studied using the nephelometer, and a secondary sample system was added to the smokemeter to allow measurement of Aitken or condensate nuclei. Each of the instruments was easily adapted for use with small smog chambers, and each displayed good precision and sensitivity to aerosol. A correlation existed between the two instruments responses to aerosol, thus permitting the reporting of smokemeter measurements in visibility and/or mass units. (Author abstract modified)

35834 **APTIC NO. 58957**

Chand, Ramesh

METHOD AND APPARATUS FOR MEASURING NITROGEN OXIDES AND SULFUR DIOXIDE CONCENTRATIONS. *(Dynasciences Corp., Los Angeles, Calif.) U. S. Pat. 3,763,025. 7p., Oct. 2, 1973. 2 refs. (Appl. Nov. 22, 1971, 5 claims).*

Nitrogen oxide and sulfur dioxide concentrations present in a gaseous mixture are rapidly and continually monitored by measuring the current passing between an inert metallic sensing electrode and a counter electrode which are in contact with an aqueous electrolyte solution and where the sensing electrode oxides are electrooxidized. The sensing electrode is composed of an inert metal and the counter electrode is composed of an electroactive lead sulfate which is electrochemically reduced when electrically interconnected with the sensing electrode in the presence of the aqueous electrolyte solution. A variable voltage source maintains the potential at the sensing electrode at the desired level. (Author abstract)

35835 **APTIC NO. 59212**

Comfort, E. H., J. S. Howitt, and J. W. MacBeth

CYCLE SIMULATION. *Preprint, Society of Automotive Engineers, Inc., New York 12p., 1973. 3 refs. (Presented at the Society of Automotive Engineers, Automobile Engineering Meeting, Detroit, Mich., May 14-18, 1973, Paper 730559.)*

Theoretical and experimental considerations and mathematical results employed to establish a stationary engine-dynamometer tests for catalytic converters are presented along with simulation results which were correlated with the Environmental Protection Agency s Federal Test Procedure (CVS-1) parameters. Working curves are presented to allow the user to predict ultimate catalytic converter performance in g/mi. Statistical correlation coefficients show predicted values and actual CVS-1 values to be highly correlated, and a linear regression analysis demonstrates that the cycle simulation procedure described provides an excellent one-to-one guide to EPA Federal Test results. The bypass engine test employed exhibits less variability in exhaust conditions, and the converter test results under these conditions are more reproducible. (Author abstract modified)

35836 **APTIC NO. 59207**

Dietz, Russell N., Edgar A Cote, and Gilbert J. Ferber

EVALUATION OF AN AIRBORNE GAS CHROMATOGRAPH FOR LONG DISTANCE METEOROLOGICAL TRACING. *Preprint, American Chemical Society, Washington, D. C., 6p., 1973. 5 refs. (Presented at the American Chemical Society Division of Water, Air, and Waste Chemistry Meeting, Dallas, Tex., April 1973.)*

NTIS: BNL 17478

An airborne real-time electron-capture gas chromotograph was evaluated for meteorological tracing of sulfur hexafluoride at distances from 6 to 90 km from the source. The experiment was conducted at the National Reactor Testing Station (NRTS) near Idaho Falls, Idaho. Calibration was partially performed at the site with lecture bottles containing 10 to the -10th power and 10 to the -11th power parts of SF6 per part of air. It was discovered that the instrument response was sensitive to barometric pressure in a non-linear way. Additional calibration was necessary and simulated barometric pressures as low as 550 mm were achieved during analyses with standard mixtures of 10 to the -9th power and 10 to the -10th power cu cm/cu cm. The use of SF6 appears impractical for long range (thousands of kilometers) tracer experiments because of the very large release amounts required to overcome the existing SF6 background.

35837 **APTIC NO. 58641**

Foster, J. F., G. H. Beatty, and J. E. Howes, Jr.

FINAL REPORT ON INTERLABORATORY COOPERATIVE STUDY OF THE PRECISION OF MEASUREMENTS OF PARTICULATE MATTER IN THE ATMOSPHERE (OPTICAL DENSITY OF FILTERED DEPOSIT) USING ASTM METHOD D 1704. *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., American Society for Testing and Materials Data Series 55-53, 68p., Oct. 26, 1973. 6 refs.*

A statistical analysis of 806 determinations of particulate matter in the atmosphere at three different sites was performed to evaluate the American Society for Testing and Materials Method D 1704-61 tape sampler technique. The average standard deviation, sb, for variations among single measurements taken by different laboratories was found related to the mean soiling index m, by the expression: sb equals 0.193 plus 0.367m. The standard deviation of 86 duplicate measurements of the optical density of the same spot by one laboratory at one site (Manhattan) was 0.55 Cohs per 1000 linear ft. Two modifications of the Test Method were suggested: a continuous sampling probe line of Teflon, glass, or other inert material with a smooth liner surface should be specified to eliminate retention of incoming particulates at connections; and the sampling probe should be free of sharp bends, connections, or any restrictions which might trap particulates. (Author summary modified)

35838 **APTIC NO. 58563**

Fujii, Toru and Takashi Nakadoi

STUDIES ON THE DETERMINATION METHOD OF ATMOSPHERIC OZONE BY CHEMILUMINESCENCE METHOD. *(Kagaku hakko no yoru kankyo taikichu ozon sokuteiho ni kansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):263, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973. Paper 18.)*

Performance tests were given to six chemiluminescence ozone meters using standard O3. The equipments were simultaneously operated, and the response time, drifts, flow rate of the material, ethylene flow rate, and the effects of tube material and the prefilter on the measurements were examined. The measurement range was 0-0.5 ppm, the O3 concentration was 0.27 ppm. The response time for 90% value rise ranged between 2 and 60 sec, and for a 10% drop ranged between 2 and 70 sec. The zero drift ranged from 0.001-0.002 bpm/day and the span drift ranged from 5-10%/day. The measurement difference between telfon and pyrex supply tubes was more than 0.1 ppm. The teflon tube tends to give lower measurements. The effect of the prefilter is relatively small.

35839 **APTIC NO. 58567**

Fukuda, Masanori, Teruo Kanasaki, Shigeo Yamaoka, and Michio Oka

DISCUSSION OF SULFURIC ACID AEROSOL DETERMINATION. *(Ryusan misuto no teiryoho ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):267, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 22.)*

To obtain a simple method of quantification of sulfuric acid mist, the chloranile acid barium method, which is used for analysis of flue gas was examined. Sampling conditions, the analysis procedure, the filter material, and the extraction solution (absorbent) were examined. The flow quantity and capturing rate, sulfuric acid and salt quantification, calibration line, time change, filter material, and comparisons of absorbent were examined and the results are presented in tables and graphs. The best result was obtained when the flow rate was 30 l/m, at 95.5% of capturing rate. Fifty percent ethanol was more satisfactory than 80% isopropanol.

35840 **APTIC NO. 58570**

Fukushima, Hiroshi, Yoshiteru Iwasaki, Tatsukichi Ishiguro, and Harukichi Onozuka

NEW METHOD FOR EVALUATING AND MEASURING OF ODOR. *(Akushu no hyoka, daisanpo, paneru ninzu no kento to jinsokuho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):384, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973. Paper 124.)*

The reliability of the number of an odor sensitivity test panel and the measurement values were examined. The material odor measurement average is a statistical figure which changes with every sampling, and the measurement distribution is a regular distribution pattern that can be formulated. To obtain a 95% accuracy, the formula calculation for the number of panel members is four. A panel of this size will produce an 80-95% reliable answer with errors of + or 10%. The panel threshold is determined by taking the mean figure of correct and incorrect dilution multiplication answers per test material. By this method, the test is quick, and the measurements agree well with the basic panel method measurements.

35841 **APTIC NO. 58486**

Fusamura, Nobuo, Takashi Iwasaki, and Toshiji Nagoya

EMISSION OF METALLIC FUME. *(Kinzoku fumu hassei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):352, 1973. (Presented at the Japan. Soc. Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973. Paper 96.)*

The emission quantity of metal fumes and the relationship between melting metal quantity and the surface area of material metal were examined and mathematically expressed. Lead in an iron pan was heated by a burner. The quantity of the material Pb, the surface area, and the melting temperature were accurately measured, and the fume was sampled by a millipore filter of 55 m in diameter, and the fume-containing air was taken in by a suction pump for 15 min at the speed of 27 l/min. Dithizone colorimetry was applied. The results are expressed by formulas and a three dimensional model.

35842 **APTIC NO. 58821**

Goto, Masahiro

COMPARATIVE MEASUREMENT OF LOW-VOLUME AIR SAMPLER. *(Low-volume air sampler no hikaku sokutei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):586, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 307.)*

Nineteen low-vol samplers were simultaneously operated on a roof garden and performances were compared. The flow quantity fluctuations, pump conditions, heat conditions, filter paper, weight concentration, and variation by filter paper were examined. There were some fluctuation of flow quantity and rate. Even under the same operation conditions, some samplers yielded considerably different measurements. Of the 19 samplings, 11 were blackish in color and eight were grayish. The causes are not known. One problem is the heat elevation, which can be as much as 40 C, especially when the machine has been in use for some time. Regular overhauling at least once a year is suggested.

35843 **APTIC NO. 58422**

Hashimoto, Yoshikazu, Keigo Nakamura, Katsunori Honma, Kinji Nakano, Kikuo Oikawa, Masuji Matsuoka, Toru Takahashi, Arisa Okano, and Eiji Ozawa

MODES OF OPERATION AND SAMPLING METHODS OF JET ENGINE EXHAUSTS. *(Jetto engin (JT3D, JT9D) no haigasu no sanpuringu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):454, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 188.)*

Jet aircraft engine exhaust gases were sampled and analyzed. The Pt-7 probe which is ordinarily attached to the exit of the turbine for measuring pressure was used successfully for sampling the exhaust gas. Three probes were attached for the JT3D engine and one was used for the JT9D engine. Each probe had a 1 m long stainless steel pipe attached to it and a long teflon tube connected the pipe to the sampling bag in the test cell. The total length of the sampling tube ran 20 to 40 m, but the temperature was not sustained to avoid the danger of explosion. The modes of operation were take-off, climbing, approaching, and idling.

35844 **APTIC NO. 58469**

Haye, N. R.

A NEW HIGH VOLUME AIR SAMPLER. *Clean Air J. (Clean Air Soc., Australia New Zealand), 7(4):67-68, 88, Nov. 1973. 2 refs.*

A new high volume air sampler was developed for use in a network of sampling stations in the tropics. The new sampler operates from normal power supplies, requires a minimum of maintenance, operates easily, and is suitable for work in tropical areas. It gives a volume flow rate of about 50 cu m/hr when using a high grade polyester filter material capable of retaining particles larger than about 0.2 micron. The unit is suitable for continuous operation. The sampler has been used continuously for one year. It is a reliable sampler for airborne particulates.

35845 **APTIC NO. 58735**

Hoenig, Stuart A.

DETECTION TECHNIQUES FOR TENUOUS PLANETARY ATMOSPHERES. *Arizona Univ., Tucson, Ariz., Electrical Engineering Dept., National Aeronautics and Space Administration Grant NGL-03-002-019, 15p., 1973. 6 refs*

NTIS: N73 29869

The use of Temperature Stimulated Exoelectron Emission was investigated for analysis of minerals and levitation of dust by electrostatic repulsion. Dust charging can be related to the question of dust levitation on Mars. The levitation phenomenon requires that dust charging be highly asymmetrical because a cloud of particles having equal numbers of positively and negatively charged particles would self-neutralize quite rapidly. An estimate of the effect of such charging on dust levitation shows that for any value of field gradient greater than 1000 volts/m dust particles will be levitated almost indefinitely. The immense dust storms on Mars are a strong indication that significant dust levitation might be present. The effects of metallic impurities on the exoelectron emission phenomenon have also been investigated. The addition of trace quantities of aluminum reduces the emission to almost zero. The addition of a similar quantity of iron raises the rate of emission, and this may be significant in view of the many suggestions of iron oxides on the surface of Mars. A review of previous work on exoelectron phenomena relating to silicosis and catalytic oxidation is presented.

35846 **APTIC NO. 58350**

Homma, Katsunori

EVALUATION OF CHARACTERISTICS OF PARTICLE MASS MONITOR. *(Particle mass monitor (T.S.I.) no seino hyoka). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):589, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 310.)*

A new particulate mass monitor was tested. A lead fume standard aerosol and atomic absorption spectrophotometry were used. By following the uniformity of concentration by a digital dust counter, the variations of wave cycles were followed and measured. Wave cycle variations were within 10%. Lead particles captured on the crystal electrodes of the monitor were dissolved by dilute nitric acid and the weight was measured by atomic absorption analysis and the ratio of the wave variation and weight was obtained. The ratio was in the area of theoretical value, 333, but with greater particle diameters, the value tended to increase.

35847 **APTIC NO. 59131**

Honma, Katsunori

SAMPLING OF GRANULAR SUBSTANCES. *(Ryushijo busshitsu no sanpuringu). Text in Japanese. Rodo Eisei Kogaku (J. Ind. Hyg. Japan), no. 13:1-8, 1973. 4 refs.*

Sampling methods for suspended particulates are reviewed. Impingers give low collection efficiency for submicron particles. Electrostatic precipitators are more efficient, but have the disadvantages of using a high-voltage power source, producing ozone around the electrodes, and the inconvenience of removing the dust collector unit for gravimetric measurement. If the proper filter paper is used, the filtration method provides the highest collection efficiency for the widest range of particle sizes. For hi-vol and low-vol samplers, the filter paper should give a 99% or better collection efficiency for particles of about 0.3 micron. Moisture absorption should not exceed 1 mg per sheet. A standard orifice method is described which introduces an ordinary flowmeter into a commercially available hi-vol sampler for accurate calibration.

35848 **APTIC NO. 58558**

Honma, Katsunori, Tadao Watanabe, and Takashi Nagaya

CHEMICAL ANALYSIS OF PARTICULATE MATTER USING THE ENERGY DISPERSIVE X-RAY ANALYZER. *(Earozoru ryushi no hibunsangata X-sen bunsekikei ni yoru sosei bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollujtion), 8(3):450, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 184.)*

The strucuture of individual particulates are completely unknown. The aerosol study group of the Institute of Industrial Health has been studying particulate compositon by the metal membrane analytical method since 1964. With the development of the Energy Dispersive x-ray Analyzer in recent years, the analysis of 0.1-0.3 micron particulates by this apparatus in conjunction with a scanning electron microscope became possible. X-rays are excited in the particulate elements by the electrons and are received by a semiconductivity detector; a multichannel analyzer selects energy and indicates x-ray spectrum on the brown tube. Photochemical smog particulates were captured in Tokyo between June and August of 1973 and observed with this apparatus. Some particulates had badly damaged metal membranes and others had completely undamaged membranes. Those destroyed had sulfur as their main constituent, with some reactive iron in the center. In the undamaged particulates, a large portion of chlorine was observed with some silicon and sodium coexisting.

35849 **APTIC NO. 58842**

Ihida, Mutsumi and Teruaki Ishii

DETERMINATION OF FLUORIDE IN STEELMAKING SLAG AND DUST BY ION-SELECTIVE-ELECTRODE METHOD. *(Ion sentaku denkyokuho ni yoru seiko suragu oyobi baijinrui no fusso no teiryo). Text in Japanese. Nippon Kokan Giho (Tokyo), no. 60:55-60, 1973. 9 refs.*

Spectrophotometric methods have been used for the determination of fluoride in steelmaking slag and dust for pollution control purposes. But these methods require sophisticated analytical techniques and operations. Ion-selective electrodes are therefore being tested. In spite of many applications of these electrodes to rivers and waste water, there have been only a few applications of them to slag and dust analyses. Electrical conditions to be satisfied by the measuring instrument, the method of dissolving the sample, the effect of pH and ion interference, and the establishment of a favorable analytical procedure permitting simple and rapid measurement at high accuracy were studied. The sample was weighed and fused with sodium peroxide in a nickle crucible. The fused matter was dissolved in water. After the precipitation of hydroxide, part of the solution was taken into a 100 ml beaker, and buffer solution was added to this portion to regulated pH. The volume of the portion was then adjusted to 100 ml, and the electrodes were dipped into it for the measurement of electromotive force. The amount of fluoride was read out from a calibration curve.

35850 **APTIC NO. 58349**

Imagami, Kazushige, Nobuyuki Kogure, and Ikuo Tamori

DEVELOPMENT OF ANOTHER ISOKINETIC DUST SAMPLER. *(Atarashii tosoku kyuin shiryo saishu sochi no kaihatsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):592, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 312.)*

A flue gas probing sampler requires a complex preliminary measurement and some device for leveling out the fluctuation of gas flow speed. To solve this problem, a leader tube containing a special pilot tube was attached to the suction nozzle to obtain an isokinetic flow of sample gas. The diameter of the leader tube is the same as that of the suction nozzle. In actual equipment, a double incline manometer to regulate the flow quantity of suction will result in a uniformal speed suction.

35851 **APTIC NO. 59021**

Ipatova, S. A. and Ye. V. Deyanova

CHROMATOGRAPHIC DETERMINATION OF ACROLEIN IN THE PRESENCE OF ALIPHATIC ALDEHYDES. *(Metod khromatograficheskogo opredeleniya akroleina v prisutstvii alifaticheskikh al degidov). Text in Russian. Gigiena i Sanit., no. 10:65-67, 1973.*

A new thin-layer chromatographic method for the separation and quantitative determination of acrolein in the presence of aliphatic aldehydes in the atmosphere and in the air of workplaces is described. The determination is based on the interaction of acrolein with m-phenylene diamine in hydrochloric acid which results in the formation of a fluorescing reaction product; 7-oxyquinoline. Silica gel-gypsum as the thin layer, 4:1 ratio of ethanol with chloroform, or 12:0.5:5 ratio of isopropanol with acetic acid and water as solvent systems are used for the determination. Determination is done fluorimetrically following extraction of the acrolein derivative from the silica gel. The sensitivity of the method amounts to 0.1 microgram in the sample volume. Formaldehyde, aromatic and saturated aliphatic aldehydes, amines, phenols, and nitrogen dioxide fail to interfere with the determination. Acetaldehyde and crotone aldehyde are determined during the chromatographic analysis. The acrolein vapors are absorbed from the air by means of 0.25% solution of hydroxylamine in hydrochloric acid and activated carbon.

35852 **APTIC NO. 58565**

Kadowaki, Suzushi, Kazumi Koike, and Ichiro Kojima

DETERMINATION OF MICRO AMMONIUM SALT IN AIR (II)--INFLUENCE ON THE METHOD FOR DETERMINATION OF ATMOSPHERIC AMMONIA. *(Taikichu biryo anmoniumuen no teiryo (dainiho), anmonia nodo sokutei ni oyobosu eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):270, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 25.)*

In measuring the quantity of ammonia in the air, the traceable amount of micro ammonium salt causes error in the measuremtnt. An attempt was made to separate NH3 and NH4 salt by a filter to see the extent of interference by NH4. Glass fiber paper was soaked in 20% sulfuric acid, dried, and put in a silica gel desiccator another filter paper without the H2SO4 treatment was placed on the holder for capturing NH4 salt; a treated filter paper was placed behind it to capture NH3. The air was sampled at the rate of 10 l/min. Ammonium salt was analyzed by pyridine-pyrazolone. The concentraton of NH4 salt correlated with the H2SO4 salt in the air and tended to increase when pollution is heavy and visibility is bad. No correlation between NH3 and any other factor was found. The measurements taken in May and June showed the average concentrations of NH3 and NH4 salt to be 9.2 micrograms/cu m and 3.8 micrograms/cu m respectively. The measurement of NH3 is approximately 30% in error if NH4 salt is not separated, and even when the visibility is clear, there is about 10% error in the measurement.

35853 **APTIC NO. 58817**

Kimura, Kikuji

MEASUREMENT OF SUSPENDING DUST. *(Fuyu funjin no sokutei). Text in Japanese. Sefuti Daijesuto (Safety Dig.), 19(12):477-488, Dec. 1973. 6 refs.*

Samplers and meters for suspended dusts are reviewed. Particle counters, turbidimeters, digital methods, cascade impactors, impingers, sedimentation methods, thermal precipitators, electrostatic precipitators, Anderson samplers, glass fiber filters, low-vol and hi-vol samplers, membrane filters, filter papers, and spectrometric methods are discussed. Photographs and diagrams of the equipment are included. Maximum allowable concentrations of various types of dusts are given.

35854 **APTIC NO. 58893**

Koike, Shigeyuki, Masayoshi Inoue, Akihiro Sakamoto, and Takeshi Katsuyama

ON THE SUSPENDED PARTICULATES CONCENTRATION (4). *(Fuyu funjin no sokutei kekka ni tsuite: Ryudo bunpu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):327, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 254.)*

Using a cascade particulate separator and hi-vol sampler, the size distribution of suspended particulates and metals were investigated. The sampler is divided into five stages; it sucks in dusts at the speed of 600 l/min and ejects them from the ring nozzle on each stage. Particulates collide onto the glass fiber filter and are captured. The glass fiber filter is weighed and burned to ash at a low temperature, and 25 ml of the ash sample is given to atomic absorption spectrophotometric analysis. Particle sizes and the accumulation frequency percentage were approximately directly proportionate, and suspended particulates and metals showed a regular logarithmic distribution. The dust mass median diameter is 2.2 micron and those of iron, manganese and chromium are 7-4 micron, and lead and cadmium are 1-1.3 micron. The ratio of particulates less than 3.7 micron (easily inhaled into the respiratory system) is 60% of the total dusts, and 31-46% of the total Fe, Mn, Cr, and Ni, and 76-85% of the total Pb and Cd.

35855 **APTIC NO. 59010**

Koyama, Yasuji, Takehiro Iwamoto, Tadashi Nishijima, and Kogoro Maeda

APPLICATION OF MASS FILTER SYSTEM TO AN ANALYSIS OF TRACE COMPONENTS IN THE ATMOSPHERIC AIR. I. NON-CONCENTRATION PRINCIPLE AND THE DETECTION LIMIT. *(Taikichu no biryo seibun bunseki e no masu firuta no tekiyo, I. hinoshukuho to kenshutsu genkai). Text in Japanese. Shitsuryo Bunseki (Mass Spectroscopy), 21(3):235- 243, Sept. 1973. 10 refs.*

Applicability of the mass filter system to the analysis of air pollutants was examined by introducing standard samples (1-10 ppm krypton, or xenon in argon) and atmospheric air without passing the concentration process. Detection of the ions analyzed by mass spectrometry, was made by using a DC amplifier and a pulse counting technique. Interference of other components and backgrounds to a mass peak was reduced by changing the acceleration energy of the bombarding electron beam. With this method, neon isotope Ne(22) in the air (about 1.6 ppm) could be measured by eliminating the contribution from carbon dioxide(++). Measured isotope abundance ratios of 1 ppm Kr and Xe in argon gases were very close to the reference values of pure Kr and Xe gases. All tests proved that the mass filter system had a sensitivity high enough for detecting 1-0.1 ppm components in the air with no help of the concentration process. This system is promising for component analysis in air pollution problems.

35856 **APTIC NO. 58400**

Kozaru, Kazuo, Toyoaki Aoki, Yasuaki Maeda, and Makoto Munemori

STUDY ON 4-HEXYLRESORCINOL METHOD FOR ACROLEIN. *(4-hekishirurezorushinoru-ho ni yoru akurorein no teiryo no kisoteki kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):605, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 326.)*

The reaction mechanism of the measurement method of acrolein by 4-hexylresorcinol is not known, and experiments were conducted to clarify it. Acrolein was captured by ethanol, hexylresorcinol, mercuric chloride, and trichloroacetic acid were added and heated for 30 min at 40 C, cooled for 15 min by water, and the absorption degreee of the blue-purple solution was measured by spectrophotometry at 605 nm. The components were analyzed by thin layer chromatography and infrared measurement. Absorption variations caused by changing the order of reagents, the role of HgCh2 in the reaction, the role of trichlorocaustic acid in the reaction, the relationship between 4-hexylresorcinol and the reaction, acrolein and the reaction, and main absorption wave values by IR are presented in tables.

35857 **APTIC NO. 59148**

Kretzschmar, J. G.

DETERMINATION OF THE AIR QUALITY OF AN UNKNOWN REGION BY MEANS OF MOBILE STATIONS. *Tribune CEBEDEAU (Centre Belge Etude Doc. Eaux), 26(361):498-503, Dec. 1973. 5 refs.*

Various approaches to measurement of air quality using mobile stations are discussed. Two different methods were used to measure existing sulfur dioxide concentrations at ground level in a region of approximately 120 sq km the maximum-minimum approach and the random-sampling approach. The region investigated was an agricultural zone with small villages influenced by a very important industrial zone and a large agglomeration at its north-northeast and east borders. The objective of the maximum-minimum approach was the determination of the extreme values that occurred in the region. A Gaussian dispersion formula was used to compute the SO2 concentration in the grid points of a regular grid as a function of the emission data, averaged over 1 yr, and the meteorological parameters averaged over 1 hr. One mobile unit measured along the maximum route and one measured along the minimum route. Final results were grouped to give the number of measurements, the average of the maxima, the maximum concentration that was measured during the campaign, the average of the minima, and the minimum concentration that was measured. In the random-sampling approach, a regular grid was superimposed on the region. Several samples were taken at each measuring point to give enough data for statistical interpretation. Results of grouping the data of different measuring points are given.

35858 **APTIC NO. 59099**

Luetzke, Klaus

THE PRACTICE OF CONTINUOUS EMISSION MONITORING BY MEANS OF PHOTOMETRIC DUST DENSITY MEASURING INSTRUMENTS. *(Zur Praxis der Emissionsdauerueberwachung mit Hilfe lichtelektrischer Staubdichtemessgeraete). Text in German. Techn. Ueberwach. (Duesseldorf), 14(12):353-356, Dec. 1973. 10 refs.*

A procedure for the calibration of photoelectric instruments designed for continuous dust concentration monitoring by extinction measurement behind drying equipment by means of gravimetric dust concentration measuring instruments is described. Calibrations were performed for a cyclone furnace and another multistage slag tap furnace, with measuring sites located behind the electrostatic precipitators in both cases. The regression analysis of the data obtained by the photometric and gravimetric methods for different operating conditions showed fairly close correlation between the gravimetric and photometric data, but also differences in the dust emissions from the two different firing equipment. Changes in the composition and granulometry of the fuel (hard coal) affected the raw flue gas to a lesser extent in the cyclone furnace than they did in the slag tap furnace.

35859 **APTIC NO. 58500**

Maeda, Hasuaki, Toyoaki Aoki, and Makoto Munemori

DETERMINATION OF TOTAL ALDEHYDES WITH 3-METHYL-2-BENZOTHIAZOLONE- HYDRAZONE. *(3-mechiru 2-benzochiazoronhidorozon-ho ni yoru zen arudehido to teiryo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):602, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 323.)*

The reaction behaviors of aldehydes to nitrogen oxides and sulfur dioxide were examined. The total aldehyde analysis method and 3-methyl 2-benzothiazolone hydrozone method were examined. The reaction gas was circulated periodically by a magnetic valve in the circulation system. The light source was a blacklight. Aldehydes were analyzed by the MBTH method, NO_2 by the Saltzman method and SO_2 by FPD gas chromatography. It was found that the measurements of aldehydes were not affected by coexistence of 100-1000 times concentrations of NO_x, SO_2, paraffin and aromatic hydrocarbons, alcohol, and ketones; but the presence of butadiene affected the measurement considerably. The hydrocarbon reactivity to these gases judged by the amount of aldehyde formation was greatest in the order of butadiene, toluene, and n-hexane. When NO_x and SO_2 coexisted, acetaldehyde did not react in a dark place, but under the light, photochemical reactions occurred and oxidants formed.

35860 **APTIC NO. 58940**

Matsushita, Shukaku, Keiichi Arashidani, and Michiko Koyano

STUDY ON THE SIMPLE ANALYSIS FOR CARCINOGENIC HYDROCARBONS IN SUSPENDED PARTICULATES IN TOWN AIR. *(Taiki fuyu funjinchu no hatsuganseі tanka suiso bunseki no kanika ni kansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):451, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 185.)*

In order to calculate the amount of carcinogenic hydrocarbons in suspended particulates simply and accurately, the following method was devised. The procedure comprises ultrasonic wave extraction, two-layer primary thin layer chromatography, and fluorescence spectrophotometry. A portion of a glass fiber filter of air sampler was cut off (8 sq cm, dusts 1-2 mg), placed in a pyrex test tube, tetrahydrofuran (4 ml) was added, and the tube was tightly corked. This was placed in an ultrasonic producer and left for 10 min and then taken out. After 5 min, the supernatent liquid was taken and a portion was painted on the A layer of the two-layer plate. The plate was put in the development tank, with the A-layer down, and developed in methanol, ether, and water, for about 60 min. The spots formed were scraped and DMSO 2 ml was added and shaken, and polynuclear aromatic hydrocarbons were easily extracted. The supernatent liquid was analyzed by fluorescence spectrophotometry. Thirty samples were examined, and the measurements were compared with those of the vacuum sublimation extract analysis method. The measurements of benzo(a)pyrene and benzo(K)fluoranthene agreed well. This method is much simpler and requires less time than the vacuum method; but the use of strong solution causes extraction of other materials and thereby limits the capacity to limited types of hydrocarbons.

35861 **APTIC NO. 59017**

Mizohata, Akira and Tesuo Mamuro

MULTIELEMENT ANALYSIS OF AIRBORNE DUST BY RADIOISOTOPE X-RAY FLUORESCENCE. *(RI keiko X-sen bunsekiho ni yoru taiki fuyujin no tagenso bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):328, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 255.)*

The mathematical principles of non-dispersive x-ray fluorescence analyzer applied to analysis of elements in suspended particulates collected on a filter paper are discussed. The intensity of x-ray fluorescence is expressed by multiplication of constant determined by analysis system, elements quantities, and matrix supplementary figures. A spectrum example of suspended particulates on a membrane filter is presented.

35862 **APTIC NO. 58530**

Mori, Osami, Hideo Tanaka, and Fumio Adachi

STUDIES ON METHOD OF MEASURING DUST CONTENT IN STACK GAS. *(Endo haigasuchu no baijinryo no sokutei hoho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):590, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 311.)*

In the flow of flue gas, the particle activities such as collisions among the particles and into the walls can form a flow irregular to the main current, and the concentration distribution can be affected by it. The relationship between particle diameter and concentration distribution in relation to the cross section horizontal plain was examined. Using a test model flue with a 270 sq mm area cross section, the dust particle samplings were taken. It was found that the dust concentration was higher close to the wass and low in the center, and the concentration was constant in the direction of flow current. In the central part of the cross section, the distribution of the particle sizes was narrow, and close to the wall, the range of particle sizes was greater. In the central area, medium-sized particles which are neither so small that they can be easily dispersed, nor to large that they have more friction, concentrate; therefore the range of particle sizes is narrower. It was confirmed that in a horizontal straight flue, dust particle distributions are varied depending on the location of sampling; therefore, sampling points must be chosen carefully, when the flue gas contains various sizes of particles.

35863 **APTIC NO. 58574**

Muramatsu, Fumio and Yasuji Himi

ANALYSIS OF HEAVY METALS IN SUSPENDED DUST. *(Taikichu jukinzoku no bunseki (dai4-po), keiko X-sen bunsekiho ni yoru bunseki jidoka ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J Japan. Soc. Air Pollution), 8(3):531, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 258.)*

The previously reported heavy metal concentration analyzer was automated this time in order to eliminate pretreatment process. The equipment consists of a sampler holder which can store 95 circular filter paper sheets by a metal or cardboard paper holder and an air suction tube. The sample filter paper can be automatically exchanged. Sampling for 1 to 24 hr is possible at the speed of 30-60 l/min. The sampler paper can be installed on the fluorescent-x-ray analyzer as is, and many elements can be analyzed simultaneously and automatically. By connecting the analyzer with a table model computer, metal concentrations can be directly recorded in mg/cu m. The sample results are presented in a graph. With this experiment, simultaneously measured nitric oxide and lead showed a high correlation. It was possible to get hourly measurement in Kawasaki for iron, lead, manganese, and titanium.

35864 **APTIC NO. 59123**

Nagasaki, M., R. Udo, Y. Hatanaka, T. Hitomi, and Y. Mito

MEASUREMENT BY SIMPLE AIR SAMPLE COLLECTION APPARATUS FOR NITROGEN OXIDES. *(Chisso sankabutsu kani taiki saishu sochi ni yoru sokutei katsudo ni tsuite). Text in Japanese. Tokyo-to Eisei kyoku Gakkai shi (Rept. Tokyo Public Health Studies), no. 52:46-47, Oct. 1973.*

A simple air sampling apparatus specific to nitrogen oxides has been developed. It is small, weighs about 8 kg, simple to operate, inexpensive, and reliable. The air to be sampled is drawn through a dust filter, a flowmeter, a NO2 impinger, a trap, an oxidation bottle containing a potassium permanganate solution, and a dehumidifier. For a 24-hour measurement period, the Saltzman reagent is used instead of the Jacobs-Hochheiser. The correlation between this sampler and an automatic measurement device is good under normal atmospheric conditions--nitrogen dioxide and nitric oxide are 0.093 and 0.986, respectively.

35865 **APTIC NO. 59152**

Nakamura, Keigo, Katsunori Honma, and Yoshikazu Hashimoto

MEASUREMENT OF JET ENGINE EXHAUSTS. *(Jetto enjin (J T3D, 9D), haigasu no sokutei kekka no ichikosatsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):461, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 195.)*

The amounts of total emission per pollutant per one flight of airplane were measured by jet engines J T3D and 9D, and the results were reported previously. The actual measurements and amounts calculated by the method of the United States Environmental Protection Agency were compared. Carbon monoxide, nitrogen dioxide, and total hydrocarbons were obtained. Although the values are different, the tendencies generally agreed and proved the accuracy of actual measurements. The plotting of g-s pollutant/1000 kg fuel/cycle, or g-s pollutants/1000 kg driving force-time/cycle of this investigation and those found in published data showed extremely close curves.

35866 **APTIC NO. 58770**

Nakao, Shozo

DETERMINATION OF NOX BY COULOMETRY AT CONSTANT POTENTIAL. *(Denryo bunsekiho (kurometori) ni yoru haigasu-chu no renzoku NOx-kei no seisaku to hyoka). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):247, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 2.)*

A continuous analyzer for nitrogen oxides in automotive exhaust gases was designed. The equipment is designed to give a quick result, a wide range of sensitivity (1-1000 ppm), a continuous operation, and to be small, portable, and structurally simple for easy maintenance. The electric potential principle and Farady s rule is used for measuring NOx in the form of nitrogen dioxide when the electric current returns. The time of measurement is 30 sec; The limit of measurement is 10-1000 ppm and accuracy in Cv is 5.7%. The measurements of 110-780 ppm of NOx were compared with other equipment and no significant difference was noted.

35867 **APTIC NO. 59493**

Nelson, J. W., I. Williams, T. B. Johansson, R. E. Van Grieken, K. R. Chapman, and J. W. Winchester

ELEMENTAL ANALYSIS OF AEROSOLS USING PROTON SCATTERING. *Proc. IEEE (Inst. Elec. Electron Engrs.), 1973:1-11, Nov. 1973. (Presented at the Nuclear Science Symposium.)*

Proton scattering appears to be a useful tool for quantitative elemental analysis of aerosols and other thin samples. The method is absolute and nondestructive, and a complete broad range analysis for all elements can be performed using proton scattering up to chlorine and proton induced x-ray fluorescence for those elements heavier than chlorine. Calibration is accomplished by measurement of yields of scattered protons from samples of previously determined density, and relative calibrations for various elements may be determined using the stoichiometric ratios for various compounds. A significant desirable feature of proton scattering is that no correction for absorption in thin layers of the sample material is needed; too thick a sample results in an immediately recognizable loss in spectral energy resolution. Spectra of air particulate matter are presented for both a total filter (Nuclepore) and a size fractionated air impactor (polystyrene backed) sample.

35868 **APTIC NO. 58441**

Ogi, Kiyohisa, Hiromichi Senju, and Norimitsu Sikada

ON THE MEASUREMENT OF SMOKE DUST FOR THE LIME BURNING FURNACE CONSTRUCTED UNDERGROUND. *(Dochushiki sekkai shoseiro yori haishutsu sareru baijinryo no sokutei ni tsuite). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 8(5):41-48, Sept. 1973. 3 refs.*

The measurement method for dusts in flue gas prescribed by the Japanese Industrial Standard is not suitable for the underground lime kiln which emits smoke directly into the atmosphere. The emission flow is immediately affected by the turbulence of the air current and the measurements are inaccurate. Three types of hoods were designed; the first is a cylinder with the diameter of 2.5 m, and the other two are hoods with simulated stacks, one with a stack of 1 m diameter, the other with a double layer of stacks with the exit diameter of 50 cm. The measurements of flow speed, temperature, dust count, and other factors of the three hoods are compared, and mathematical analyses are given. The hood with the exit of 1 m diameter was most suitable, since the first hood was influenced by the turbulence of the outside current, and the hood with a small opening caused too much resistance and the total emission quantity was reduced.

35869 **APTIC NO. 58319**

Ohta, Shoji and Tomoyuki Ito

METHOD OF MEASUREMENT OF THE BACKGROUND CONCENTRATION OF SUBMICRON AEROSOLS AND SOME RESULTS FROM THE OBSERVATIONS AROUND THE OGASAWARA ISLANDS AND MARCUS ISLAND. *Kisho Kenkyusho Kenkyu Hokoku (Meteorol. Res. Inst. Rept.), 24(1):111-137, March 1973. 22 refs.*

In order to measure very low concentrations (such as the global background values) of submicron aerosols, improvements were made to a Pollak-type condensation nucleus counter and a photographic recording Aitken-type counter was developed. The Pollak-type counter has a sampling and instrumental error of less than 2%. The Aitken-type counter allows estimation with 90% confidence. A system combining the two counters was suitable for field measurement of the background concentration of submicron aerosols. This was done abroad weather ships near the Ogasawara Islands and Marcus Island on the Pacific Ocean in the summers of 1970 and 1971. The global background on the South West Pacific Ocean is about 150-250 n/cc. The time variation of the background concentration during time intervals of about 4-10 hr is 10-20%. The size distribution type shows a maximum concentration at size 0.000001 cm.

35870 **APTIC NO. 58440**

Okita, Toshikazu, Yoshio Urushiyama, and Ryuichi Sugai

A STUDY ON THE MEASUREMENT OF ATMOSPHERIC PARTICULATE MATTER USING LOW VOLUME AIR SAMPLER OF FUNNEL TYPE. *(Jogogata ro boryumu ea sanpura ni yoru fuyu ryushijo busshitsu sokuteiho no kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):588, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 309.)*

A funnel-type particulate classifier sampler was devised using the weight settling property of particulates. The apparatus is made of stainless steel and comprises a filter paper holder of funnel shape, a particulate classifier box, and an outer case. The suspended particulates enter through the gap between the outer case and the classifier. Only particulates of less than 10 microns are sucked into the funnel-shaped filter paper of 5.5 cm diam and captured there. The limit sizes for this apparatus are mathematically presented. The results were compared with the results taken by a multi-level lo-vol sampler and a cyclone lo-vol sampler. The funnel type lo-vol sampler showed good correlations with both types of samplers.

35871 **APTIC NO. 58442**

Okita, Toshikazu

CHEMILUMINESCENT OZONE AND NOX RECORDERS. *(Kagaku hakkoho ni yoru ion oyobi chisso sankabutsu no sokuteiho ni tsuite). Text in Japanese. Kiku Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 11(6):26-32, Dec. 1973. 8 refs.*

The principles of ethylene chemiluminescent recorders for ozone and nitrogen oxides are discussed and explained by diagrams. The tests by the Japan Environmental Agency proved that the ethylene chemiluminescence ozone monitor is very accurate when ethylene purity is more than 99%; that the variation of measurements depends very much on the air flow rate, and an apparatus with small fluctuation should be used; and that when the pressure at the entrance of the ozone monitor is reduced, the measurement of ozone also decreases, and this requires special care when measuring ozone by helicopter. The use of a telfon filter for eliminating particles also causes elimination of ozone by several percent; if the amount of particles captured on the filter increases, the ozone elimination rate also increases, especially when the humidity is high. The principles and the chemical reaction of nitrogen oxides by chemiluminescence are explained. No successful method for the chemiluminescent measurement of nitrogen dioxide has been established.

35872 **APTIC NO. 58568**

Oshima, Tsugukage and Osamu Hayashi

STANDARD GAS GENERATING SYSTEM--BY THE RATIO OF FLOW RATE OF THE GASES. *(Hyojun gasu hassei sochi). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):252, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 7.)*

The designing and construction of a systematic gas generator for sulfur dioxide, nitric oxide, nitrogen dioxide, carbon monoxide and hydrocarbons was begun in Sept. 1972 and will be completed in Feb. 1974. The equipment is capable of producing CO from 2 ppm to 20% and other gases from 0.1 ppm to 1%, using 12 capillary flowmeter. The gases are produced at the high precision of + or 1-1.5% while the temperature is controlled at 25 C. The equipment comprises a high pressure gas container, pressure flow quantity control, a capillary selector, pressure difference control, concentration monitoring, a flowmeter calibrator, and a temperature pressure monitoring device. With a computer program, more than 4 hr of contiuous production of gas at a desired concentration is possible; also by programming, the concentration can be switched within 3 min. The varied functions of the apparatus are described.

35873 **APTIC NO. 59353**

Riggs, R. Kent

AIR SAMPLING DEVICE. *(National-Southwire Aluminum Co., Carrollton, Ga.) U. S. Pat. 3,765,247. 6p., Oct. 16, 1973. 5 refs. (Appl. Oct. 22, 1971, 7 claims).*

An air sampling device for obtaining samples from aluminum reduction plant atmospheres where determination of dust and other particulates is required has been developed to operate without the aid of an electrically-powered vacuum pump, thus eliminating flow rate variations encountered in prior art devices as a reult of the effect of magnetic fields generated during reduction operations. The device operates solely by compressed air which is conducted through a venturi tube and creates a region of reduced pressure for drawing ambient air into the device. Particles or gases are trapped in a filter for analysis. The device includes a manifold which has several fittings, each adapted to receive individual sample-collecting chambers so that several samples may be taken consecutively. (Author abstract modified)

35874 **APTIC NO. 58692**

Robinson, J. W.

DIRECT DETERMINATION OF METALS IN AIR. (FINAL REPORT). *Louisiana State Univ., Baton Rouge, La., Dept. of Chemistry, National Environmental Research Center Grant AP 800866, Proj. 26AEK-12 1AA010, Rept. EPA-650/2-73-011, 67p., Aug. 1973. 7 refs.*

NTIS: PB 226774/AS

An instrument was developed capable of the direct determination of metals in air. No prior scrubbing or extracting of the metals from the air is necessary. Consequently, the time necessary for analysis is a matter of minutes, permitting real time analysis to be carried out on small volumes of air. The method was based on atomic absorption spectroscopy and involved the development of aa highly efficient atomizer. The sensitivity of the method was determined to be about 10 to the minus 12th power g. Procedures for the correct quantitative determination of lead, mercury, and cadmium in the air were developed. Calibration techniques were studied, and reliable analytical techniques were developed. (Author abstract)

35875 **APTIC NO. 58428**

Sakata, Mamoru, Shigeo Yasui, and Keigo Nakamura

GAS-CHROMATOGRAPHIC ANALYSIS OF HYDROCARBONS IN JET ENGINE EXHAUSTS. *(Jetto enjin (JT-3D, 9D) no haigasu-chu no tanka suiso no GC benseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):457, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 191.)*

Hydrocarbons in jet engine exhaust were condensed and measured by gas chromatography. For C1 and C2, Squalane 1%, carrier active alumina 60/80 mesh column was used at a normal temperature; for C2 and C8, Apiezon L 25%, carrier Shimalite 60/80 mesh, 6 m long, was used at 70-200 C; for above C9, OV-101 20%, carrier Shimalite 60/80 mesh, 2-5 m long was used at 70-250 C column was used. The total emission concentration becomes lower in the order of idle, approaching, climbing, and take-off, and the values of JT-3D are greater than JT-9D. The total hydrocarbon concentration of idling exhaust gas was 862.1 ppm for JT-3D and 201.0 ppm for JT-9D.

35876 **APTIC NO. 58305**

Sasaki, Yasuhiro, Masahiko Kubota, Yukitatsu Omoto, and Yoshinori Kurata

MEASUREMENT OF REGIONAL AIR POLLUTION WITH CORRELATION SPECTROMETER. *(Sokan supekutoro meta ni yoru taiki osen sokutei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):280, 1973. (Presented at the Japan. Soc. Air Pollut., Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 33.)*

Using the correlation spectrometer (COSPEC), methods of calculating local emissions of sulfur dioxide and nitrogen dioxide were examined. The COSPEC was loaded on an automobile and, directing a telescope perpendicularly to the sky, measurements were taken at various spots on the driving route which circumscribed an area. The traverseline mass flow quantity was calculated from mass flow quantity, mass flow quantity ratio, chart area, chart distance, driving distance, average wind speed, corrected cell readings, and corrected cell constant. The measurements were taken before and after a desulfurization system was installed for one stack gas emission source. The results are presented in maps and tables.

35877 **APTIC NO. 58399**

Sato, Hasuhito, Kuniyoshi Makino, Nobuyoshi Osawa, and Isao Mizoguchi

COMPARATIVE MEASUREMENTS OF ATMOSPHERIC ACROLEIN. *(Akurorein sokutei no hikaku kento ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):604, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 325.)*

The methods for measuring acrolein by chemical analysis (4-hexylresorcinol) and gas chromatography were compared. A known concentration of acrolein was poured into a 2.66 cu m smog chamber and measurements were taken by both methods. When ethyl alcohol was used as absorbent, it evaporated both at normal and low temperature samplings, and the collection efficiency of acrolein decreased extremely. When the coloring agent was mixed prior to measurement, the values tended to be higher and an interference was suspected. The normal and low temperature samplings when using a mixed liquid showed no significant difference. Gas chromatograpy by concentration tends to be low; the reason may be the use of decarbonic acid and dehydrating agents.

35878 **APTIC NO. 59183**

Shaw, Glenn E., John A. Reagan, and Benjamin M. Herman

INVESTIGATIONS OF ATMOSPHERIC EXTINCTION USING DIRECT SOLAR RADIATION MEASUREMENTS MADE WITH A MULTIPLE WAVELENGTH RADIOMETER. *J. Appl. Meteorol., 12(2):374-380, March 1973. 20 refs.*

A multiple wavelength solar radiometer designed for measuring atmospheric optical depth at discrete wavelengths through the visible region is described. Experimental techniques, including sample observations, are presented for obtaining atmospheric optical depth from radiometer measurements. These techniques apply for conditions where the optical depth is either temporally variant or invariant during the course of a day. The influence of the aerosol size distribution on optical depth is investigated. Theoretical calculations of the wavelength dependency of the aerosol optical depth contribution are presented for several representative aerosol size distributions. Methods are also presented for estimating the aerosol size distribution and aerosol mass loading from multiwavelength optical depth measurements. (Author abstract)

35879 **APTIC NO. 58464**

Siemer, D., J. F. Lech, and R. Woodriff

DIRECT FILTRATION THROUGH POROUS GRAPHITE FOR A. A. ANALYSIS OF BERYLLIUM PARTICULATES IN AIR. *Spectrochim. Acta, 28B(12): 469-471, Dec. 1973. 7 refs.*

A method is described for the determination of beryllium particulates in air by furnace atomic absorption spectrophotometry. A small volume of air is filtered through the walls of a porous graphite cup. The cup containing the entrapped particulates is then inserted in a constant temperature graphite furnace. Measurements can be made over the concentration range 2-20 micrograms/cu m with sample volume of 50 cu cm. The observed analytical precision is 15%. The cups and the sampling device are portable, and an entire analysis including the sampling step can be performed in under 5 min. Extension of this technique to other elements should be very easily achieved as the need arises. (Author abstract modified)

35880 **APTIC NO. 59472**

Skare, Ingvar

TOTAL ALDEHYDES. SAMPLING: CUMULATIVE. ANALYSIS: TITRIMETRIC (BISULFITE METHOD). *National Board of Occupational Safety and Health, Stockholm (Sweden), Dept. of Occupational Health, Method Rept T 105/73, 15p., 1973. 7 refs.*

A method for the sampling and analysis of lower aliphatic aldehydes in air is presented. The sampling method involves leading the aldehyde-containing air through a wash bottle containing a bisulfite solution (cumulative sampling); while the analysis involves oxidation of the excess bisulfite with iodine and splitting of the aldehyde complexes with an alkaline buffer. The liberated quantity of sulfite equivalent to the aldehyde quantity is finally titrated with a weak iodine standard solution. The sensitivity of the method is about one micromol aldehyde/sample titrated, while the relative standard deviation in the analysis step is less than 3% even at the sensitivity limit. High excesses of ketones, hydrogen sulfide, hydrogen cyanide, or phenol in the air sample will give positive interferences.

35881 **APTIC NO. 59202**

Sparks, C. J., Jr., O. B. Cavin, L. A. Harris, and J. C. Ogle

SIMPLE, QUANTITATIVE X-RAY FLUORESCENT ANALYSIS FOR TRACE ELEMENTS. *Preprint, Missouri Univ., Columbia, 29p., 1973. (Presented at the Conference on Trace Substances in Environmental Health, Annual, 7th, Columbia, Mo., June 12-14, 1973.)*

The application of x-ray fluorescence analysis for the determination of trace elements offers cheap, rapid, quantitative analysis without time-consuming prior chemical concentration or alterations. The x-ray fluorescent system presented uses a monochromatic source of x-rays and a solid-state detector energy analyzing system capable of detection limits below 1 ppm by weight for heavy elements to 10 ppm for lighter elements in a variety of environmental samples. Monochromation by diffraction gives a monoenergetic source for excitation and improves detectability compared with the systems using white radiation or transmission target x-ray tubes. Direct calculations of elemental concentrations without preparation of standards or known additions is possible with monochromatic x-rays at precisions comparable with other techniques. A description of the x-ray fluorescent unit and examples of its application for quantitative analysis are given. Techniques under development for the direction of trace elements to a few ppb are described. The system was used to measure iron, copper, zinc, arsenic, bromine, lead, and other trace elements in orchard leaves and coal. (Author abstract modified)

35882 **APTIC NO. 58600**

Sugimae, Akiyoshi, Yuzuru Matsuo, and Toshio Hasegawa

TRACE METALS IN AIRBORNE PARTICULATES (12). *(Fuyu funjinchu no kinzoku seibun (dai12-ho)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):530, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 257.)*

Spectrophotometry is not very sensitive to arsenic, antimony, cadmium, lead, copper, and zinc. Using boiler cup electrodes, these elements in suspended particulates were alalyzed using spectrophotometry and the results showed satisfactory improvements on the metal sensitivity. Samples were taken for 24 hours by hi-vol sampler and carefully selected filter paper. A neck electrode was heated to 80 C, and treated in 5% paraffin carbon tetrachloride solution and dried. Glass fiber filters treated with 20 microfilters/of methanol with 4 mm diameter perforations were packed into the electrode up to the cup level. The number of filter paper ranged from 6 to 10. Fifty microfilters of an Indium (concentration 10 ppm) internal standard solution was dropped into the packing. A boiler cup with an orifice of 2.4 mm was installed and this was used as a test material electrode. The calibration line was prepared by the standard method and the elements in samples were quantitated. When filter paper is burned to ash, usually Cd, Pb, Zn, and Cu disperse and Pb and Cd react to the glass fiber filter at a high temperature. In this experiment, the filter papers were burned at 400, 500, and 600 C, and measurements were compared with filter papers treated at low temperatures. The quantities of As, Sb, Pb, Cu, Cd, and Zn showed satisfactory agreement.

35883 **APTIC NO. 58383**

Swartz, D. B., M. B. Denton, and J. L. Moyers

ON CALIBRATING OF CASCADE IMPACTORS. *Am. Ind. Hyg. Assoc. J., 34(10):429-439, Oct. 1973. 19 refs.*

A simplified inexpensive polydisperse wax aerosol calibration method for cascade impactors is described. An aerosol is generated by the condensation of wax vapor. The size distribution of the aerosol is controlled by the flow rate of a carrier gas stream. Microscopic counting and sizing procedures are detailed. Various methods for evaluating impactor performance characteristics are reviewed and discussed. Calibration data using this method are presented for a commercially available impactor and for a specially constructed cascade impactor. (Author abstract modified)

35884 **APTIC NO. 58348**

Tanaka, Akemi, Mashiro Hori, and Yoshitaka Kobayashi

STUDIES ON THE COLLECTION FOR DETERMINATION OF TRACE CONCENTRATION OF COMPOUNDS IN AIR BY HIGH VOLUME AIR SAMPLER. *(Hai boryumu ea sanpura ni yoru taikichu biryo shian kagobutsu no hoshuho no kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):593, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 314.)*

To capture low concentrations of hydrogen cyanides in the air in a short time, a glass fiber filter treated with ammonia alkaline nickel was attached to a hi-vol sampler to obtain a stable compound. This method was successful in trapping 0.5 microgram (traceable) concentrations at the rate of about 90%. Various trapping agents, such as potassium carbonate, and nickel salt were also treated. When nickel salt was used, the collection rate was good but the fluctuation was too large. When nickel ammoniate was used, a stable trapping rate was obtained. The best results were obtained when two layers of filter paper was used and the flow rate of about 6 l/min was used. The trapping rate was 100% for 10 min, and 90% for 20 min. In order to improve the trapping rate, ammonia must be supplied on the surface of the filter paper. The filter paper after trapping is successfully preserved.

35885 **APTIC NO. 58522**

Tatsukawa, Ryo and Tadaaki Wakimoto

PHTHALIC ACID ESTERS IN THE AIR. *(Taikichu no futarusan esuteru). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):607, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 328.)*

An efficient and sensitive method of analyzing phthalic acid esters in the atmosphere was devised, based on the solid adsorption capturing method by a glycerine coated phloridyl column and ECD gas chromatography. After the air is passed through a phloridyl packed column, the tube is washed by 100 ml ethyl alcohol and the solution is put in a separation funnel tube with 700 ml of water. Hexane is added and shaken violently for 5 min, and a n-hexane layer is separated. The water layer is extracted by n-hexane again; the n-hexane layer is washed three times by water and is condensed to 5 ml. The concentrate is poured into a chromatography column packed with activated phloridyl, and n-hexane containing 15% ethyl ether is passed at the speed of two drops/sec. Phthalic ester is captured by n-hexane containing 5% ethyl alcohol; it is condensed to 5 ml and is applied to ECD gas chromatography. The column is packed with 80-100 mesh chromosorb.

35886 **APTIC NO. 58397**

Terabe, Motoji, Fumihide Matsumotor, Toshiaki Inoue, and Akira Murase

SOURCE MONITORING SYSTEM IN KAWASAKI (II). *(Kawasaki-shi ni okeru hasseigen aryusan gasu jido kanshi shisutemu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):404, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 141.)*

Examining the amount of fuel consumption and sulfur dioxide emission quantity obtained by the automatic telemeter monitoring system for emission sources in Kawasaki, and comparing these with the data presented by industries on fuel consumption, the problems of inaccuracy in the monitoring system were examined. For fuel consumption, there were 4.5-1.5% errors. The causes may be the fuel tank meters pressure difference, which causes 3-4% error habitually, and the difference of the specific weights of fuels. The errors for SO2 emission quantities were 14% to 3.4%. These might have been caused by the difference between the average sulfur content and set sulfur content, and by emissions from sources omitted from the telemeter monitoring. The data in general yields about + or 10% error.

35887 **APTIC NO. 58922**

Terabe, Motoji, Akira Murase, Fumihide Matsumoto, and Yoshio Iwase

MEASUREMENT OF SUSPENDED PARTICULATES FOR ENVIRONMENTAL STANDARD. *(Fuyu ryushijo busshitsu no kankyo kijun ni tomonau sokuteiho no kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):248, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 3.)*

To obtain variable coefficients of suspended particulates in Kawasaki, a low volume sampler with a multi-level particle classifier attachment, a digital dust counter, a high volume air sampler, and a paper tape air sampler were used and the effect of humidity was checked by a hydrometer. The measurements were taken for 24 hours as a unit between April and August, 1973. The known problem of digital dust counters with high humidity was again confirmed. In high humidity, rain, or fog, the count tended to be higher than other measurements. The variable coefficient was very much affected by it, and when humidity was more than 80%, the coefficient by the digital dust counter was 0.660, whereas when the measurements taken when more than 80% humidity was excluded, the correlation was 0.929. The correlation between the digital dust counter and other equipment was mathematically obtained.

35888 **APTIC NO. 58569**

Tomizawa, Toshi

DETERMINATION OF SULFURIC ACID AEROSOL. *(Ryusan misuto no sokuteiho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):268, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 23.)*

A new method for the quantification of sulfuric acid mist, the barium chloride additive method was examined. The method attempts to stabilize the H2SO4 ion as barium sulfide by the reaction between H2SO4 and barium chloride; hydrochloric acid is driven out at a temperature higher than 110 C, and by measuring hydrogen chloride, H2SO4 is indirectly quantitated. The method was examined using standard HCl. The limits of quantification were 2.5-25 micrograms of H2SO4, and above that level, a line was not formed.

35889 **APTIC NO. 58377**

Tsuji, Masahiko, Toshihide Okuno, Kozo Shintani, and Hiroshi Watanabe

ON THE ANALYSIS OF SULFUR COMPOUNDS IN AIR BY FLAME PHOTOMETRIC DETECTOR. *(FPD ni yoru taikichu io kagobutsu no bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):382, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 122.)*

Calibration methods and gas chromatography with a flame photometric detector were examined for measuring sulfur compounds with odor. For calibration, instead of the standard solution of sulfur compounds, which is unstable when the amount is traceable, dilution by nitrogen gas was used. After forming a secondary curve on the logarithm graph, a straight line was attained. Hydrogen sulfide, methyl mercaptan, and methyl sulfide test gases were diluted by the room air and left at the room temperature; the time changes were checked by gas chromatography. The H2S condensed down to 45% in 24 hr; but when diluted by nitrogen gas instead of the room air, H2S concentration was stable for several days. Methyl mercaptan and methyl sulfide concentration reduced several percents in two days. Therefore, in actual odor tests of H2S, the U-tube condensation must be stabilized and cooled on site and then taken back to the lab for analysis. With other sulfides, if analysis is given within two days after sampling, the error will be within several percent.

35890 **APTIC NO. 58405**

Umehara, Koichi and Chiaki Sato

ON THE DETERMINATION OF GASEOUS PCB S. *(Kiso PCB no sokutei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):600, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 321.)*

To measure gaseous polychlorinated biphenyls, an easy concentration device was constructed in place of the expensive wet pressure concentration device designated by the Japan Environmental Agency. The conditions set by the Agency include a device for washing down the flow channel by n-hexane and a pump and flow channel made of metal, glass, or teflon. In order to fulfill these requirements, a commercial pump was improved by converting the diaphragm, valves, and packing into teflon and attaching capillaries at the entrance of the pump for flow quantity adjustment. Commercial filter-type gas scrubbing jars were used for absorption jars. These were taken to the site of air quality measurement and the jars and the pump were connected with teflon tubes for PCB concentration. Costs are given.

35[illegible]1 **APTIC NO. 59015**

Volkov, S. A., Ye. G. Rastyannikov, and L. N. Tarasova

GAS-CHROMATOGRAPHIC DETERMINATION OF LOW CONCENTRATIONS OF CARBON MONOXIDE IN THE ATMOSPHERE. *(Gazo-khromatograficheskoye opredeleniye mikrokontsentratsiy okisi ugleroda v atmosfernom vozdukhe). Text in Russian. Gigiena i Sanit., no. 10:62-64, 1973. 1 ref.*

A method for the standard gas-chromatographic determination of small concentrations of carbon monoxide in the atmosphere is described. Molecular strainers type CaA was found to be most suitable for the separation of CO from methane in an additional column at the temperature of liquid nitrogen. Gas-chromatographic determination was done at 200 C by using absolute calibrations for concentrations under and over 10 mg/cu m. One complete analysis takes 15 min at a sample volume of 300 ml, and 10 min for a volume of 100 ml.

35892 **APTIC NO. 58786**

Yatabe, Teruo, Takeo Oiwa, and Katsusuke Mizuno

EVALUATION OF CONDUCTIVITY-TYPE AND COULOMETRY TYPE FOR MONITORING SO2. *(Dodenritsushiki oyobi denryoshiki SO2 monita no hikaku shiken). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):250, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 5.)*

The error factors of electroconductivity measurements of sulfur dioxide were examined by comparing the results from coulometry measurements of SO2 during a six-month field test. A 24-hour measurement was taken every 10 days by the pararosanilin method. It was discovered that the error factors of electroconductivity measurements were mostly evaporation losses of the absorbent rather than the effects of pollutants other than SO2. The errors can be expressed by the functions of absorbent temperature, atmospheric temperature, humidity, and SO concentration. An adjustment coefficiency was obtained from the average temperature and humidity during the field test period and the figures from the electroconductivity monitor were corrected and the results agreed well with the pararosanilin figures.

35893 **APTIC NO. 59102**

Yoshida, Kenichi, Midori Numakawa, and Shizuo Sato

REINVESTIGATION OF THE JACOBS-HOCHHEISER METHOD. *(Jacobs- Hochheiser-ho no kairyoho ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):260, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 15.)*

The problems in the Saltzman method and the Jacobs-Hochheiser method for manual measurement of nitrogen dioxide were corrected by modifying the absorbent and stabilizing it by neutralization. The absorbent was prepared by 0.1 N-sodium hydroxide solution plus n-butanol and guaiacol and was neutralized by hydrochloric acid. Guaiacol, carbowax 6000, and sulphanylamid were tried as the additive for increasing the absorption rate, and the best result and reliability were obtained by guaiacol 0.018 m (2 ml/l). The rate in the first absorption tube was more than 99%. Carbowax had a more than 95% absorption rate at 30 g/l, but the viscosity required a slow suction speed and measurement of low concentrations was difficult. The absorption method and spectrometry analyses follow the previous Jacobs-Hochheiser method. Stabilized by hydrochloric acid, the solvent will keep for several montas without changing quality, if it is kept in a cool, dark place. The stability is several times superior to that of the Saltzman reagent.

35894 **APTIC NO. 59189**

Young, F. C., M. L. Roush, and P. G. Berman

TRACE ELEMENT ANALYSIS BY PROTON-INDUCED X-RAY EXCITATION. *Int. J. Appl. Radiation Isotopes, vol. 24:153-163, March 1973, 11 refs.*

The proton-induced x-ray excitation technique is a promising method for the simultaneous analysis for trace elements over nearly the entire range of the periodic table. Only mg quantities of material are required and the sensitivity changes quite slowly and smoothly from element to element in contrast to the method of neutron activation. The technique is nondestructive and a minimum or no work in sample preparation is required. The sample must be thin and reasonably uniform. For maximum sensitivity, the sample must be either self-supporting or mounted on a very thin backing. Samples are generally placed in a high vacuum for irradiation although the potential exists to irradiate samples outside the vacuum by passing the beam through a thin window. These requirements are ideally suited to many types of samples, including environmental samples. A typical spectrum obtained from a sample of air pollution is shown. (Author summary modified)

35895 **APTIC NO. 59097**

Yudilevich, M. M., G. V. Nemirov, A. F. Yeliseyeva, G. V. Ilkina, and V. V. Kazanskiy

JOINT DETERMINATION OF THE NITROGEN DIOXIDE AND SULFUR DIOXIDE CONTENTS IN THE AIR. *(Issledovaniye vozdukha na soderzhaniye dvuokisi azota i sery pri sovmestnom prisutstvii). Text in Russian. Gigiena i Sanit., no. 10:113, 1973.*

Methods for the determination of nitrogen dioxide and sulfur dioxide, present in the air simultaneously at the respective concentrations of 41 micrograms/l and 250 micrograms/l, as well as the interaction of the two components as a source of interference in their determination were studied. Nitrogen dioxide was determined by the Griess-Ilosvay photocolorimetric method following absorption in 8% solution of potassium iodide. The SO_2 was absorbed in sodium chlorate solution for subsequent photocolorimetric determination of the resulting barium sulfate suspension at 450 nanom. The NO_2 concentration in the NO_2-SO_2 mixtures studied decreased to 50% of the original value during 20 min storage in a closed space due to oxidative and reductive reactions taking place between the two components. The NO_2 concentration measured after 24 hr amounted to 81-100% of the original concentration. The SO_2 concentration fell to 52-67% in 20 min, to 34-62% in 25 min, and further to 10-10% of the original concentration in 24 hr, due to the adsorption of the sulfuric acid formed with water vapor on the vessel walls. The SO_2 should be absorbed immediately at the sampling site for determination. The determination of NO_2 should be completed with that of nitric oxide formed during storage.

35896 **APTIC NO. 59343**

Zaromb, Solomon

REMOTE SENSING APPARATUS AND METHODS. *(Assignee not given.) U. S. Pat. 3,768,908. 11p., Oct. 30, 1973, 5 refs. (Appl. Jan. 4, 1971, 16 claims).*

A remote sensing lidar spectroscopic apparatus has been developed to provide an optical means of detecting such commonly encountered air pollutants as sulfur dioxide, nitrogen dioxide, and ozone at distances over 1 mi. The invention consists of a laser transmitter and a receiver in which the radiation return is spectranalyzed, a fluorescent target at a considerable distance from the transmitter and receiver and a means for aiming the transmitter and receiver at the target. The transmitted radiation is preferably in the 0.25-0.3 micron range of ultraviolet wavelengths, such as those obtainable from the fourth harmonic of a neodymium laser or from the second harmonic of an argon ion laser. The presence of pollutants between the lidar system and the target is deduced from the attenuation of the radiation return at several wavelengths and/or from the Raman backscatter due to specific air pollutants. (Author abstract modified)

35897 **APTIC NO. 58913**

Zutshi, P. K. and T. N. Mahadevan

A CONTINUOUS SEQUENTIAL AIR SAMPLER FOR ENVIRONMENTAL STUDIES. *Indian J. Technol. (India), 11(5):230-232, May 1973, 3 refs.*

The design and fabrication of a sequential air sampler for the continuous and simultaneous monitoring of different air pollutants is presented. Collection of six different samples during one complete rotation of the sequential system along its linear axis is possible, and the sampling interval and number of samples collected during a 24-hour period can be altered by making necessary changes in the number of outlets in the distribution head or by altering the period of the reduction gear system. Sampling of the air is achieved by operation of a suction pump, and pollutant samplers containing suitable absorbing solutions for the particular pollutants are provided. The stream of air after bubbling through the absorbing solution enters a scrubber system containing a common solvent which removes all the chemical spray carried by the current of air as it emerges from the pollutant sampler, and excess moisture is removed by a silica gel column before the air enters the distribution system. Sulfur dioxide concentration levels measured with the system at the Bhabha Atomic Research Center in Trombay are presented in graphic form.

35898 **APTIC NO. 58814**

Japan Environmental Agency, Air Quality Bureau

TECHNICAL ASPECTS OF OFFENSIVE ODOR CONTROL LAW (II) -- ON THE MEASUREMENT OF OFFENSIVE ODOR SUBSTANCES. *(Akushu boshiho no gijutsuteki sokumen (II), Akushu busshitsu no sokutei hoho ni tsuite) Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 3(12):1-5, Sept. 1973.*

Sampling and analytical methods for measuring odors are reviewed. Filters treated with sulfuric acid can be used to measure ammonia, and the efficiency depends on the flow rate of the gas, the dryness of the filter, and the amount of residual H_2SO_4 in the filter. Methyl mercaptans, hydrogen sulfide, and methyl sulfide may be measured by flame photometric detector. A correction curve is important to the accuracy of this method because the output of the detector is not proportional to the concentrations of the sulfides, but proportional to the nth power of the concentration. Glass components of the measuring apparatus should be treated with phosphoric acid. Methyl sulfide is analyzed by both a H_2SO_4 filter and a flame photometric detector.

1972

35899 **APTIC NO. 58680**

Bergman, I. and D. A. Windle

INSTRUMENTS BASED ON POLAROGRAPHIC SENSORS FOR THE DETECTION, RECORDING AND WARNING OF ATMOSPHERIC OXYGEN DEFICIENCY AND THE PRESENCE OF POLLUTANTS SUCH AS CARBON MONOXIDE. *Ann. Occupational Hyg. (London), vol. 15:329-337, 1972. 3 refs.*

Atmospheres containing insufficient oxygen to support life are sometimes formed in mines and in many other industrial environments, usually in the form of layers or pockets of gas. These atmospheres can be detected, and their boundaries defined with oxygen-measuring instruments that have been developed to an advanced stage. Commercial versions of some of the instruments should soon be available. The instruments are based on an improved form of polarographic electrodes consisting of a metallized membrane with a pocket-size meter, a miniature audible alarm, a flashing cap-lamp alarm, and a recorder with a remote sensor and a flashing alarm. A similar system has been investigated as a means of measurement for dangerous concentrations of carbon monoxide, and a pocket-size meter has been constructed. An adapted form of the metallized membrane electrode has also been used for measuring dissolved oxygen. (Author abstract)

35900 **APTIC NO. 59050**

Bonometti, G.

THE PERFORMANCE OF THE BARRINGER CORRELATIVE SPECTROMETER. *(Performances du spectrometre correlatif Barringer). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 10p. (May 3-5.)*

The performance of a Barringer type spectrometer, permitting the qualitative detection of sulfur dioxide in the atmosphere by photometric measurement of the luminous energy transmitted by this gas in the spectral band of 2000-3150 A, was tested at a thermal power plant. The SO2 concentration measured by means of the correlative spectrometer was in a range of 0.023-0.125%, against a theoretical value of 0.6%. The substantial divergence was found to be due to an attenuation of the light energy around 3100 A by fog, nitrogen, carbon dioxide, and carbon monoxide. The SO2 transmission spectrum at 3100 A disappeared when this gas was dissolved in water vapor. It was impossible to detect SO2 in a field larger than 0.0000078 steradian. The Barringer correlative spectrometer is suitable for the detection of SO2 in the atmosphere, and thus for the determination of its dispersion, from which both the rate of expansion of the SO2-containing layer, the mean concentration, and the dilution factor can be calculated provided the rate of discharge and the layer thickness are known.

35901 **APTIC NO. 58627**

Cooke, M. J., A. J. B. Cutler, and E. Raask

OXYGEN MEASUREMENTS IN FLUE GASES WITH A SOLID ELECTROLYTE PROBE. *J. Inst. Fuel, 45(373):153-156, March 1972. 5 refs.*

An electrochemical oxygen probe for in situ measurements of oxygen partial pressures in hot flue gases has been constructed and tested in the laboratory, in an experimental fluidized bed combustor, and in a coal-fired boiler. The probe measurements in the fluidized bed system agreed with the results of gas chromatographic and paramagnetic analysis for oxygen under normal operating conditions, and any interruptions in coal feed or air supply were instantly registered by the readings. Tests of a few hours duration in a pulverized-coal-fired boiler gave satisfactory results, although accumulation of ash and slag on the probe introduced errors. Slagging on the end of the probe presented problems at temperatures above 1200 K, while at temperatures below 1000 K the gradual accumulation of dry ash on the outer electrode interfered with the reading given by the probe. (Author abstract modified)

35902 **APTIC NO. 59454**

Copeland, G. E. and A. R. Bandy

CORRELATION OF SATELLITE AND GROUND DATA IN AIR POLLUTION STUDIES. *Old Dominion Univ. Research Foundation, National Aeronautics and Space Administration ERTS-1 Contract MMC 229-01, GSFC ID UN672, Task 1 (UN 672), 6p., Sept. 30, 1972.*

NTIS: N72-33317

The image analysis laboratory, implementation of ground truth facilities, and examination of U-2 imagery of the Chesapeake Bay region are described. These were studied during a correlation of ERTS-1 satellite and ground data in air pollution studies. The primary area studied by satellite photography was centered on the entrance to the Chesapeake Bay in Virginia. Ground data came from 25 air quality data stations in the target area. Meteorological data and information on major fires was also compiled. As of Sept. 30, 1972, no ERTS-1 imagery has been available of the target area due to cloud cover. Imagery of several complete orbital passes over the U. S. was viewed, and evidence was established that smoke plumes can be detected by ERTS-1.

35903 **APTIC NO. 58755**

Dahneke, B. E., H. Flachsbart, F. J. Moenig, and N. Schwarzer

ON THE EVAPORATION OF SMALL DROPLETS IN AEROSOL BEAMS. *Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 10p. 4 refs. (May 3-5.)*

Aerosol beams may be valuable in several applications, including the sampling and classification of atmospheric aerosols. However, since aerosol beams are generated by expanding a small flow of aerosol into a vacuum, an immediate question is what is the fate of droplets of volatile liquids such as water. If these droplets evaporate, the particles and droplets remaining in the beam are no longer exactly representative of the original samples. The motion of latex spheres was studied theoretically and experimentally. The demonstrated substantial cooling. Because of the substantial reduction of temperature during the generation of aerosol beams, evaporation of droplets in these beams does not appear to be significant, at most a few percent of the total droplet mass.

35904 **APTIC NO. 59463**

Davis, Warren F. and Judson W. Graab

PROCEDURE FOR RAPID DETERMINATION OF NICKEL, COBALT, AND CHROMIUM IN AIRBORNE PARTICULATE SAMPLES. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA-TM-X-2672, Rept. E-7105, Work Unit 501-01, 16p., Nov. 1972. 13 refs.*

NTIS: N73-11111

A rapid, selective procedure for the determination of 1-20 micrograms of nickel, chromium, and cobalt in airborne particulates is described. The method utilizes the combined techniques of low-temperature ashing and atomic absorption spectroscopy. The airborne particulates are collected on analytical filter paper, the paper is ashed, and the residues are dissolved in hydrochloric acid. The Ni, Cr, and Co are then determined directly with good precision and accuracy by atomic absorption. The effects of flame type, burner height, slit width, and lamp current on the atomic absorption measurements are reported. Speed and convenience are increased by the use of dual-channel instrument, which permits simultaneous measurement of two elements, and by the use of the same flame conditions for all three elements. Since no separations, filtrations, or transfers of solutions are necessary, 20 samples may be analyzed in 2 hr. The recovery of Ni, Cr, and Co is 92-100% complete. This is satisfactory in the 0.2-1.0 ppm range and gives confidence in the precision and accuracy of the procedure.

35905 **APTIC NO. 59191**

Derr, V. E.

RESEARCH PROBLEMS IN THE USE OF LIDAR IN ANTI-POLLUTION STUDIES. *National Oceanic and Atmospheric Administration, Boulder, Colo., Environmental Research Labs., NOAA-72111001-47, p. 339-350, Aug. 1972. 3 refs. (Also: Proc. Workshops Res. Probl. Air Water Pollut., Boulder, Colo., p. 309-321, 1971. (Aug. 3-15.))*

NTIS: COM-73-10119

Research problems in the use of lidar for the measurement and control of air and water pollution are discussed. Some of the aspects considered are of the lidar in aerosol determination and wind sensing, and Raman and fluorescent scattering in laser ranging. Lidar is a useful device at short ranges for pollutant measurement, humidity profile determination, and wind sensing. (Author abstract modified)

35906 **APTIC NO. 58756**

Fugas, Mirka, J. Hrsak, and Dragica Steiner-Skreb

WALL LOSSES WITH THE MODIFIED ANDERSEN CASCADE IMPACTOR. *Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 9p. 6 refs. (May 3-5.)*

Between Aug. and Dec. 1971, a number of samples were simultaneously collected by a modified Andersen cascade impactor and a high volume sampler, situated close together about 5 m above the ground. The wall losses of the modified Andersen sampler were established. The losses of suspended particulates were considerable (35% on the average). The losses of manganese and iron particles were also appreciable (15% and 16% respectively). Only the losses of lead particles were negligible (2.6% on the average). This is explained by the much smaller size of lead particles (diameter about 0.2 micron) in comparison with manganese (1.8 micron) and iron particles (about 4.2 micron). The modified Andersen impactor can be used for the routine assessment of the lead content of air, but not for measuring total particulate concentrations. (Author abstract modified)

35907 **APTIC NO. 58316**

Higashino, Ichiro, Muneo Hitomi, and Meguru Yamamoto

A MULTICOMPONENT HIGH-SPEED INFRARED GAS ANALYZER OF AUTOMOTIVE EXHAUST USE. *Osaka City Univ. (Japan), Dept. of Engineering, Japanese Assoc. of Railway Industries Technical Memorandum No. 10, p. 399-410, Dec. 1972. 3 refs.*

An infrared gas analyzer to measure simultaneously the concentration of carbon monoxide, nitric oxide, and methane in automotive exhaust gas is described. The device is a single-beam type with a multireflective sample cell and a cooled indium antimonide detector. The wavebands of absorption are selected by three narrow band-pass optical interference filters. With a temperature of the radiation source about 1100 K and optical path in the sample cells of 1200 mm, the lowest measurable concentration for CO is about 500 ppm and nearly equals the expected value. The lowest concentrations obtained for NO and CH4, under the conditions described above, are about 900 and 1400 ppm, respectively.

35908 **APTIC NO. 58864**

Hoekstra, I. Arthur

THE WICKEDNESS OF AIR POLLUTION MEASUREMENTS. *Instrument Society of America, Pittsburgh, Pa., Proc. Instr. Soc. Am. Conf. Exhibit, Annu., 27th, New York, 1972, 8p. 9 refs. (Oct. 9-12, Paper 72-707.)*

The difficulties in achieving accurate air pollution measurements are discussed. The adoption of stricter and stricter clean air regulations has created a condition in which the requirements for measurements have outpaced the capabilities of traditional instruments and former techniques to keep abreast. Examples of unjustified decisions include the need to collect data beyond the limit of detection, the adoption of a deficient nitrogen dioxide test method by the Environmental Protection Agency, and the simultaneous requirements adopting implementation plans to achieve ultimate air quality standards within a limited time period. Common dishonest sampling procedures are cited for carbon monoxide, oxidants, sulfur dioxide, mercury, and NO2. (Author abstract modified)

35909 **APTIC NO. 59040**

Jacquot, R. D. and E. A. Houser

QUALIFICATION TESTING OF AN INFRARED ANALYZER SYSTEM FOR SO2 AND NO IN POWER PLANT STACK GAS. *Instrument Society of America, Pittsburgh, Pa., Proc. Instr. Soc. Am., Conf. Exhibit, Annu., 27th, New York, 1972, 17p. 3 refs. (Oct. 9-12, Paper 72-730.)*

A field qualification test is described to determine the application suitability of an analysis sampling system using nondispersive infrared analysis for the measurement of sulfur dioxide and nitric oxide in coal-fired power plant stack gas. The initial system was modified and operated for approximately 6 wk. Daily comparisons were made between analyzer readings and wet chemical determinations for SO2 and NO. Overall agreement was better than 5% on the average and better than 11% at the 95% confidence level. Analyzer stability averages less than 1% of full scale per day; the 95% confidence level extremes were less than 5% of full scale per day. The effects of several sample condition parameters were evaluated such as adsorption in sample lines and filter; cooling and condensing; interference by water vapor and carbon dioxide. All had an insignificant effect on the analysis within the accuracy observed. The modified sampling analysis system is suitable as a process monitor for SO2 and NO in power plant stack gases. (Author abstract modified)

35910 **APTIC NO. 59049**

Kaaijk, J.

POTENTIOMETRIC METHOD FOR THE DETERMINATION OF AIR POLLUTION BY FLUORIDES. *(Une methods potentiometrique pour determiner la pollution fluoree de l atmosphere). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 13p. 4 refs. (May 3-5.)*

Sampling techniques and potentiometric methods for determination of fluorine compound concentrations in the air are described. A variation of an Adams sampler with dripping capillary, and buffer solution composed of sodium carbonate, citric acid, and sodium CDTA at pH 5.5 are used for the absorption and concentration of the fluorine compounds. To obtain good separation of gaseous from particulate fluorine compounds, particles larger than 1 micron are captured before reaching the sampler. The fluorine concentration is determined by means of a fluorine-specific electrode which measures potential difference against a calomel reference electrode in the presence of fluorine ions. By replacing the buffer solution every 24 hr, it is possible to measure fluorine ion concentrations in a range of 0.05-15 micrograms/cu m.

35911 **APTIC NO. 59223**

Loeffler, F. and W. Muhr

IMPROVED CALCULATION OF THE PARTICLE INERTIAL SEPARATION ON FIBERS. *(Verbesserte Berechnung der Teilchenabscheidung an Fasern infolge Traegheitskraeften). Text in German. Inst. Natl., Rech. Chim. Appl., Dixieme Colloq. Atmos. Poliuees, Proc., Paris, France, 1972, 13p. 11 refs. (May 3-5.)*

An improved method for the calculation of the particle separation by elemental cylindrical fibers in general, and of the rate of impact on the fiber (a factor in determining the separation efficiency) is presented. Compared to known calculation methods, the new method has the advantage of taking the flow boundary layer along the fiber cylinder surface for high Reynolds numbers of 50-100 into account. The boundary layer flow was calculated from the Hohlstein-Bohlen equations. The degree of impact was found to be dependent not only of the inertia parameters but also of the Reynolds number even in the case of pure potential flow. When the boundary layer is taken into account; the rate of impact is essentially lower, since the effect of the boundary layer increases with the reduction of Reynolds number. The influence of the boundary layer reduces with increasing inertia parameter.

35912 **APTIC NO. 58754**

Maloney, Clifford J.

THE LIMITS OF MEASUREMENT. *Inst. Natl. Rech. Chim. Appl. Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 11p. 14 refs. (May 3-5.)*

The quantitation of the effects of pollution is discussed in general terms. The role of quantitation and measurement in science are distinct. The critical role of mensuration in science, the history of the theory of measurement, the limits of measurement, properties of types of scales, and the limitations of measurement are discussed.

35913 **APTIC NO. 59455**

Miranda, Henry A., Jr. and John Dulchinos

A BALLOON-BORNE AEROSOL COUNTER. (FINAL REPORT). *GCA Corp., Bedford, Mass., GCA Technology Div., Air Force Cambridge Research Labs., Contract F19628-70-C-0265, Proj. 7621, TASk 762103, Work Unit 76210301, DoD Element 34111F, DoD Subelement 6369AJ, AFCRL-71-0416, GCA-TR-71-3-A, 76p., Jan. 1972. 7 refs.*

NTIS, DDC: AD 737802

A balloon-borne aerosol counter which samples and sizes individual particles to an accuray of + or 10% over an order of magnitude size range extending down to the 0.1-0.2 micron diameter regime, was successfully flown. The aerosol counter system uses a laser and operates on the principle of light scattering. The device is completely self-contained and recoverable. The data are recorded on 9-channel magnetic tape in digital format compatible with an IBM 360 computer, and are processed automatically. Stratospheric aerosol size distributions were obtained in increments of 1 and 2 km, up to and including balloon float altitudes (above 23 km). These represent the first such direct information available, and are presented here in preliminary form. A description of the device, together with a discussion of calibration and automatic data reduction procedures and with recommendations for improvements in the latter, are given. The computer program is discussed, and field data are given. (Author abstract modified)

35914 **APTIC NO. 58782**

Mizohata, Akira and Tetsuo Mamuro

ELEMENTAL ANALYSIS OF AIRBORNE DUST BY ENERGY DISPERSIVE FLUORESCENT X-RAY SPECTROMETRY. *Annu. Rep. Radiat. Cent. Osaka Prefect., vol. 13:16-22, 1972. 7 refs.*

A study was made to resolve some problems involved in the application of energy dispersive fluorescent x-ray spectrometry to elemental analysis of airborne dust samples collected on a membrane filter. In the attempt to determine simultaneously as many elements as possible, it should be remembered that the energy of characteristic x-rays may extend down to 1.0 keV. In order to make accurate quantitative multielement analysis, the deviation from the proportionality relation which holds (in a thin specimen) between the counting rate of characteristic x-rays and the mass per unit area of the corresponding element present must be determined. To determine correction factors for specimens of medium thickness in which this proportionality relation does not hold, 13 airborne dust samples, in which dust mass per unit area varied in a range from 0.2 to 7.5 mg/sq cm, were subjected to both x-ray fluorescence analysis and instrumental neutron activation analysis. The experimental results thus obtained were compared with the theoretical relations obtained assuming appropriate absorption coefficients with dust. On the basis of these data, the 12 elements, potassium, calcium, titanium, vanadium, chromium, manganese, iron, nickel, copper, zinc, bromine, and lead were detected for actual dust samples by excitation of an americanium-241 source. (Author abstract)

35915 **APTIC NO. 58969**

Novak, Jiri

METHOD OF AND APPARATUS FOR CONTINUOUS ELECTROCHEMICAL METERING OF SUBSTANCE CONCENTRATIONS IN GASEOUS MEDIA, WITH ELECTROLYTE RECIRCULATION. *(Ceskoslovenska Akademie ved, Prague (Czechoslovakia)) U. S. Pat. 3,790,449. 6p., Feb. 5, 1974. 1 ref. (Appl. June 12, 1972, 5 claims).*

A method and apparatus for continuous electrochemical monitoring and analysis of noxious substances such as sulfur dioxide, hydrogen sulfide, halogens, and ozone in gaseous media are described. An electrolyte solution is drawn from a storage tank and forced successively through a monitoring system of electrode cells with at least one indicating electrode and a reference electrode cell. Harmful products arizing in electrode reactions are rendered ineffective by electrochemical reactions. A major portion of the electrolyte solution is reintroduced into the storage tank to be repeatedly recirculated. A minor portion is passed through the reference electrode cell. The electrolyte solution is an aqueous solution of sulfuric acid which is saturated with elemental iodine during its passage between the storage tank and the metering system. (Author abstract modified)

35916 **APTIC NO. 59036**

Raillere, R. and P. Suzanne

THE USE OF FLAME PHOTOMETRY FOR THE CONTINUOUS RECORDING OF LOW CONCENTRATIONS OF SULFUR COMPOUNDS IN THE ATMOSPHERE. *(Utilisation de la photometrie de flamme pour l enregistrement, en continu, de faibles concentrations de produits sulfures, dans l atmosphere). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 9p. (May 3-5.)*

The optimum conditions of the use of flame photometry for the continuous recording of low concentrations of sulfur compounds in general and of sulfur dioxide in particular in the atmosphere were studied. Premixing burners are not suitable for flame photometers due to their inherent instability. Hydrogen and the air containing the sulfur compound to be determined are supplied through two separate concentratic nozzles, using the central one for hydrogen, and a second safety flame for hydrogen not burned in a main flame. The air is sucked in by depression. The interference filter is centered to the most intense band of SO_2 at 393 micron and it has a transmission band of 5 micron for a transmission rate of about 50%. The limits of SO_2 detection by flame photometry are 0.04 mg/cu m and 3 mg/cu m.

35917 **APTIC NO. 59491**

Riediger, G.

PARTICLE COUNTING AND PARTICLE SIZE ANALYSIS BY MEANS OF THE QUANTITATIVE TELEVISION MICROSCOPY. *(Teilchenzaehlung und Teilchengroessenanalyse mit Hilfe der quantitativen Fernseh-Mikroskopie). Text in German. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 16p. (May 3-5.)*

The principle and possibilities of quantitative television microscopy in particle counting and particle size analysis, as well as comparative analyses with the Quantimet quantitative television microscope and projection microscope, are described. Quantitative television microscopes are composed of an epidiascope, a light or electron microscope, a television camera with monitor, a detector, and a computer. Such television microscopes require well-defined optic and electronic ajustments for reproducible measurements, and their results as well as the particle counts obtained, are basically determined by the adjustment of the gray threshold. They are suitable for objective analysis, especially of thermal precipitator and conimeter samples. Conimeter samples removed after heating the adhesive layer were analyzed by two persons using the Quantimet microscope, and a correlation of 0.997 was obtained for the two measurements. The correlation factor was somewhat lower (0.988) for conimeter samples that were not heated for their removal. The correlation factor calculated for measurement data obtained by means of Quantimet and a projection microscope was 0.983.

35918 **APTIC NO. 59473**

Skare, Ingvar

NITROGEN DIOXIDE - MANUAL METHOD. *National Board of Occupational Safety and Health, Stockholm (Sweden), Dept. of Occupational Health, Method Rept. T 131/72, 15p., 1972. 5 refs.*

A manual method for the sampling and analysis of nitrogen dioxide is presented. The analysis method is based on direct absorption of NO2 from the air sample in a Saltzman reagent for the production of a red-violet color whose extinction is proportional to the amount of NO2 absorbed. The method s high sensitivity allows for analyses with air samples less than half a liter. Two alternative sampling procedures are presented: sampling in evacuated gas pipettes (0.7-10 ppm) and sampling in a syringe (1-15 ppm). Sensitivity of the method is about 1 ppm NO2 for the syringe technique and about 0.7 ppm NO2 for the gas pipette technique. Relative standard deviation for both methods is within plus or minus 10%. Strong oxidizing agents such as ozone or chlorine and reducing compounds such as hydrogen sulfide or sulfur dioxide can interfere with the results at high excess; nitric oxide, although it doesn t react with the reagent, can interfere at high concentrations by oxidation to NO2.

35919 **APTIC NO. 59041**

Williamson, James A., Jr.

OXIDATION OF NITRIC OXIDE TO NITROGEN DIOXIDE FOR PHOTOMETRIC MEASUREMENT OF NOX IN EMISSION SOURCE MONITORING. *Instrument Society of America, Pittsburgh, Pa., Proc. Instr. Soc. Am., Conf. Exhibit, Annu., 27th, New York, 1972. 4p. 10 refs. (Oct. 9-12, Paper 72-714.)*

The oxidation of nitric oxide to nitrogen dioxide under pressure for the photometric measurement of nitrogen oxides in emission source monitoring is described. Instrument systems and portable survey instruments were developed using this technique in source monitoring and source survey work. The analysis of NOx produces a linear response over the entire range of the instrument. With a 10 times range selector, the instrument can be used with full scale ranges of 300 and 3000 ppm NOx. The lowest full scale range used is 100 ppm NOx with detectability at 2% of full scale. A digital panel meter is used for direct readout of concentration. A calibration filter is included in the instrument to simplify calibration checks.

35920 **APTIC NO. 58758**

Perkin-Elmer Corp., Pomona, Calif.

OPERATIONS AND MAINTENANCE MANUAL. ATMOSPHERIC CONTAMINANT SENSOR. ADDENDUM 1: CARBON MONOXIDE MONITOR MODEL 204. *National Aeronautics and Space Administration NASA-CR-128602, 23p., March 1972.*

NTIS: N73-11394

A nondispersive infrared carbon monoxide monitor is described. System features, control and monitors, design functions, operational procedures, maintenance, calibration, troubleshooting actions, and diagnostic indicators are described.

35921 **APTIC NO. 59484**

National Board of Occupational Safety and Health, Stockholm (Sweden), Dept. of Occupational Health

SULFUR DIOXIDE - MANUAL METHOD. (FINAL REPORT). *Method Rept. T 126/72, 14p., 1972. 7 refs.*

A method for the sampling and analysis of sulfur dioxide concentrations in the range of 1-50 ppm is presented. The method used is the thorin procedure which is based on the hydrolysis and oxidation of sulfur dioxide to sulfate by the absorption solution. The sulfate content is then titrated with barium ions to give a barium sulfate precipitate. The end-point of the titration is established by the metal indicator thorin which gives red complexes with most metal ions. Analysis of low concentrations of sulfate requires the use of a photometric device for the end-point determination. The sensitivity of the procedure is about 0.5 micromols of SO4 per sample titrated, and the relative standard deviation of the analysis can be kept within plus or minus 5% in the range of 0.5-5 micromols SO4 per sample titrated. The most severe interferences to the method arise from the presence of calcium, iron, and aluminum; all of these can be eliminated by using a proper filter connected before the sampling vessel. Normally, the only interference to take into account is hydrogen sulfide gas.

1971

35922 **APTIC NO. 59515**

Brink, J. A., Jr. and J. D. Porthouse

EFFICIENT DUST CONTROL VIA NEW SAMPLING TECHNIQUE. *New Hampshire Univ., Durham, Center for Industrial and Institutional Development, Air Pollut. Sampling Monit. Workshop, Durham, N. H., 1971, p. F96-F100. 6 refs. (Reprinted from Chemical Engineering, March 10, 1969.)*

A total dus sampler which includes an industrial high-volume vacuum cleaner plus air flow and pressure measuring devices has been designed to provide accurate data for the design of dust-control systems, particularly in relation to air requirements, dust loadings, and particle size distribution. Three manometers are included in the apparatus: one measures the internal gage pressure of the process vessel, while the other two measure the pressure drops across the bag filter and orifice meter. The industrial vacuum-cleaner portion of the sampler can deliver 80 cfm at a pressure drop of 65 in. of water. Dust loading is determined by dividing the change in sampler weight by the total volume of gas that passes through the sampler during the test; and particle-size distribution is obtained by mixing the sample from the drum to ensure uniformity, subdividing it, and then analyzing a representative portion. Screening is adequate for determination of particle size distribution if the particle size is relatively large. Examples of typical applications are presented.

35923 **APTIC NO. 58621**

Craig, Douglas K.

THE INTERPRETATION OF ROTAMETER AIR FLOW READINGS. *Health Phys., vol. 21:328-332, Aug. 1971. 8 refs.*

The importance of calibrating rotameters (variable area flowmeters) under exactly the same conditions as those under which they will be used is examined. Calibration data is presented to demonstrate the magnitude of error that can arise when using a rotameter downstream of an air sampling device across which there is a pressure drop. Use of a pressure gauge to measure the pressure at the flowmeter (on the same side of the valve as the rotameter float) enables corrections to be applied and serves as a very good leak detector since for a given sampling device and flow rate the pressure drop should be roughly the same from one sample to another. Flow rates should be employed that will give as low a pressure drop as possible and meter readings at the upper end of the rotameter scale. (Author conclusions modified)

35924 **APTIC NO. 59052**

Dave, J. V.

DETERMINATION OF SIZE DISTRIBUTION OF SPHERICAL POLYDISPERSIONS USING SCATTERED RADIATION DATA. *Appl. Opt., 10(9):2035-2044, Sept. 1971. 28 refs.*

Results of a numerical experiment are presented to show that measurements of the monochromatic light scattered by typical atmospheric aerosols (assumed spherical) can be used to obtain meaningful information about the variations of the particle number density with particle radius. Simulated measurements of about three significant figure reliability taken at 1-degree intervals in the range 80-180 degrees are analyzed using the well-known least-square method to retrieve particle number density information in as many as twenty subintervals. For this purpose, it is necessary to have some a priori information about the largest and smallest particles present in the polydispersion and also about the refractive index of the material. Measurements of the components of the scattered radiation parallel and perpendicular to the plane of scattering, i.e., the polarization measurements, rarely contained extra formation about the size distribution. The results of inverting Seltzer s radiation measurements are compared with the size distribution measured by him using direct technique. (Author abstract)

35925 **APTIC NO. 59258**

Dinges, H. W. and K. Lenhardt

MASS SPECTROSCOPIC INVESTIGATIONS OF AIR POLLUTION: DETECTION METHOD FOR ORGANIC SUBSTANCES. *(Massenspektrometrische Untersuchungen von Luftverunreinigungen; hier: Nachweismethode fuer organische Substanzen). Text in German. Technical Report of the Research Institute of the Fernmeldtechnisches Zentralamt der Duetschen Bundespost, Jan. 1971, 45p. 9 refs.*

NTIS: N72 31619

A mass spectroscopic procedure for the identification and quantitative determination of trace quantities of organic substances in the air, dangerous pollutants for platinum metal and tungsten components in communication equipment, is described. The spectra of pure organic substances, such as of olefins, alcohols, organic acids, aldehydes, ketones, and benzene derivatives, are determined by means of a simple focussing mass spectrometer, and catalogued for the identification of unknown organic components. The air samples to be analyzed for organic vapors are separated to different fractions in a Porapak Q-filled column, after which the samples are bombarded with electrons under high vacuum. The identification of substances with the same mass is possible by fragmentation. Mass spectra of the reference substances n-paraffins, n-hexane and its isomers, n-propane, n-propene, heptenes, methanol, ethanol propanol, n-butanol, propylene oxide, propione aldehyde, acetone, and allyl alcohol are given.

35926 **APTIC NO. 58628**

Fee, Gordon G.

MULTIPARAMETER AIR QUALITY ANALYZER. *Instrument Society of America, Inst. Soc. Am. Proc., Houston, Tex., 1971, 5p. 3 refs. (April 19-21, Paper D-4.)*

An automatic air quality monitor was developed for measuring carbon monoxide, methane, and total hydrocarbons. It uses gas chromatographic columns and a hydrogen flame detector to obtain analyses of all three parameters within 5 min. The basic instrument is described in detail. Operating characteristics, performance, and data handling techniques are discussed. A description is given of those features which allow the instrument to be easily interfaced with computer-polled air quality monitoring networks or data loggers. Sufficient data, including costs, are included to allow potential users to compare this new multiparameter analyzer with competing techniques. Accurate and interference-free measurements of CO, CH4, and HC can be made over a wide range of concentrations. Full scale sensitivity as high as 0-1 ppm can be obtained. Support requirements, maintenance, and calibration of the instrument are mentioned. (Author abstract modified)

35927 **APTIC NO. 58707**

Hanst, Philip L.

SPECTROSCOPIC METHODS FOR AIR POLLUTION MEASUREMENT. *In: Advances in Environmental Science and Technology. James N. Pitts, Jr. and Robert L. Metcalf (eds.), Vol. 2, New York, Wiley, 1971, p. 91-213. 75 refs.*

Spectroscopic methods for air pollution measurement are discussed and the infrared spectra of selected pollutants are presented. Infrared absorption spectra are presented for methane, ethane, propane, butane, pentane, hexane, formaldehyde, acetyaldehyde, nitrogen dioxide, hydrogen chloride, deuterium oxide, carbon monoxide, nitric oxide, sulfur dioxide, ozone, ethylene, ammonia, methanol, propylene, acetylene, and peroxyacetyl nitrate. The use of laser radiation absorption for pollutants is discussed for methane, nonmethane hydrocarbons, formaldehyde, acetyaldehyde, deuterium oxide, carbon monoxide, nitric oxide, sulfur dioxide, ozone, ethylene, ammonia, and methanol. Other topics include: long optical paths, radiation sources, and detection instrumentation.

35928 **APTIC NO. 59222**

Levina, T. A. and V. L. Gershkovich

MEASUREMENT OF THE DEW POINT OF FLUE GASES. *(Izmereniye temperatury rosy dymovkyh gazov). Text in Russian. Tr. Inst. Goryuch. Iskop., Moscow, 26(1):73-77, 1971. 7 refs.*

Three different dew point measuring instruments; two based on Johnstone s principle, and one galvanic type, were studied concerning their suitability for dew point measurement in hot, dusty, flue gases as a means of controlling the neutralization of sulfur trioxide by gaseous ammonia. The instruments were inserted in the flue gas duct in a temperature zone of 180-200 C where the flue gas flow rate was in a range of 10-12 m/sec. Ammonia was dosed at a rate of 20 l/hr in a temperature zone of 200-220 C. With a sulfur dioxide concentration of 0.13-0.27% by volume, the rate of SO2 conversion to SO3 was 1.2-3.6%. The galvanic sensor with annular electrode and universal cooling, artificial heating, and low-inertia measurement of the electromotive force was found best for dew point measurement and control of the SO2 neutralization with ammonia in flue gases with high dust concentrations.

35929 **APTIC NO. 59451**

Measures, R. M.

A COMPARATIVE STUDY OF LASER METHODS OF AIR POLLUTION MAPPING. *Toronto Univ. (Ontario), Inst. for Aerospace Studies, UTIAS Rept. 174, 28p., Dec. 1971. 36 refs.*

NTIS, DDC: AD 746280

A comparative study was made of three laser methods for remotely mapping gaseous pollutants. Differential absorption and scattering were superior for measuring nitrogen dioxide and sulfur dioxide with regard to range and sensitivity than either laserrinduced fluorescence or Raman backscattering. Because of the sophistication of this system and the difficulty of interpretation, it is strongly recommended that from the long-term view the fluorescence approach should be pursued further, since it has a range and sensitivity superior to the Raman scattering method for a given laser power. An alaysis of the fluorescence return expected from a local source of NO_2 indicates that a plume of about 10 ppm could be detected at a range of several km. However, due to absorption effects, care must be used in the interpretation of signals emanating from local concentrations in excess of about 10 ppm. (Author abstract modified)

35930 **APTIC NO. 58624**

Rigdon, Lester P. and Richard W. Crawford

AN EXPERIMENTAL SYSTEM FOR DETERMINING NITROGEN OXIDES IN AIR. *California Univ., Livermore, Lawrence Radiation Lab., UCRL-51057, TID-4500, UC-4, Chemistry, 16p., June 15, 1971. 13 refs.*

NTIS: UCRL-51057

An apparatus was set up to study the effectiveness of Hochheiser s and Saltzman s scrubbing solutions in removing nitric oxide and nitrogen dioxide from air. These methods are often used to sample and analyze nitrogen oxides in the air. The apparatus included a dynamic gas calibration system that was designed to deliver from 1.5 to 1500 ng/min of NO and/or NO_2. The gas reacted in either or both of two static scrubbers, then passed into a scrubbing coil for dynamic colorimetric analysis. The efficiency with which the scrubbing solutions removed NO and/or NO_2 under various conditions was studied. Preliminary studies with xenon oxide (XeO_3) and osmium oxide (O_2O_4) in basic solutions indicated that strong oxidants could markedly improve the efficiency of Hochheiser-like solutions. Ruthenium oxide (RuO_4) and sodium xenon oxide (Na_4XeO_6) were also candidates for improving the absorption of NO_2 in basic solution. (Author abstract modified)

35931 **APTIC NO. 58738**

Sievering, Herman

REMOTE SENSING FOR AIR POLLUTION MEASUREMENTS. *In: Advances in Environmental Science and Technology. James N. Pitts, Jr. and Robert L. Metcalf (eds.), Vol. 2, New York, Wiley, 1971, p. 263- 288. 39 refs.*

Remote sensing and its application for air pollution measurements are discussed. ATmospheric remote sensing techniques include active and passive systems. An active system involves transmission of a signal, interaction with a target, and quantitative as well as qualitative detection. A passive system involves the detection of natural meanations of the target and in no way interacts with it. Air pollutants in the forms of gases, solid particles, or liquid aerosols exist either separately or in combinations. Gaseous pollutants constitute about 90% of the total mass emitted to the atmosphere, while particulates comprise the rest. Atmospheric particles vary widely in size, assuming an optimal wavelength near 1 micron. The following measurement techniques are described: passive satellite optical probing, passive or active correlation techniques, optical infrared line of sight measurements, acoustic, and laser radar. Methods of measuring gaseous pollutants that are discussed include: passive satellite infrared probing, infrared line of sight absorption analysis, and laser radar.

35932 **APTIC NO. 59511**

American Inst. of Chemical Engineers, New York

COMMUNITY AIR QUALITY INSTRUMENTATION. *New Hampshire Univ., Durham, Center for Industrial and Institutional Development, Air Pollut. Sampling Monit. Workshop, Durham, N. H., 1971, 59p. 16 refs. (Also: A.I.Ch.E. Today Series: Air Pollution Control, New York)*

Community air quality sampling procedures and equipment are reviewed in relation to establishing and evaluating control measures, evaluating model parameters, and determining areas and time periods when hazardous levels of pollution exist in the atmosphere. Topics covered include: objectives of a sampling program, general considerations for sampling, a typical air sampling train, characteristics of primary sampling devices, methods of analysis and instrumentation currently available, automatic community air quality monitoring networks, and biological monitoring methods using plants as indicators.

35933 **APTIC NO. 59512**

American Inst. of Chemical Engineers, New York

EFFLUENT SAMPLING AND MONITORING. *New Hampshire Univ., Durham, Center for Industrial and Institutional Development, Air Pollut. Sampling Monit. Workshop, Durham, N. H., 1971, 84p. 5 refs. (Reproduced from the A.I.Ch.E. Today Series Air Polluton Control, New York)*

A review is presented on methods and instrumentation for making gas quantity and velocity measurements and subsequent stack sampling (particulate and gaseous) once the flow rate and velocity profile in a duct have been obtained. Considerations covered include: obtaining a representative sample, errors due to non-isokinetic sampling, errors due to probe size or configuration, null-type sampling probes, and miscellaneous probe errors. Sampling train devices reviewed include: dry particulate collectors, absorption collectors and impingers, and freeze-out traps. Particle size determination is also discussed.

35934 **APTIC NO. 59513**

STACK MONOTORING. *New Hampshire Univ., Durham Center for Industrial and Institutional Development, Air Pollut. Sampling Monit. Workshop, Durham, N. H., 1971, 69p. 64 refs.*

A review is presented on stack monitoring and stack effluent analysis procedures. Both manual observation methods (Ringelmann) and automatic opacity measuring techniques (light transmittance) are covered for stack-smoke monitoring. Abstracts of collection and analysis procedures (preparation for sampling, sampling, sample processing, analysis, and calculation) as related to gaseous constituents of stack emissions are provided for the following: ammonia and ammonium compounds; organic acids; aldehydes; formaldehydes; oxides of nitrogen; fluorides; sulfur oxides; hydrocarbons; orsat analysis (carbon dioxide, carbon monoxide, oxygen, and nitrogen); and chlorine and chlorine compounds. Proposed test methods of the Environmental Protection Agency are also presented.

1970

35935 **APTIC NO. 59185**

Christie, A. A., R. G. Lidzey, and D. W. F. Radford

FIELD METHODS FOR THE DETERMINATION OF NITROGEN DIOXIDE IN AIR. *Analyst (London), vol. 95:519-524, May 1970. 14 refs.*

Two field methods are proposed for determining 2 to 10 ppm of nitrogen dioxide in air; a liquid absorption and colorimetric method based on a Griess-Ilosvay reaction (Saltzman modified) in which NO_2 recovery is improved by the incorporation of sodium arsenite in an alkaline absorption solution; and a test-paper method which is unaffected by humidity and air, that involves the use of papers, treated with p-anisidine and glycerol, with a storage life of 3 mo. In both methods the apparatus required is easy to manipulate and transport and less than 10 min are required for a complete determination. (Author abstract)

35936 **APTIC NO. 59458**

Derr, V. E. and C. G. Little

A COMPARISON OF REMOTE SENSING OF THE CLEAR ATMOSPHERE BY OPTICAL, RADIO, AND ACOUSTIC RADAR TECHNIQUES. *Appl. Opt., 9(9):1976-1991, Sept. 1970. 20 refs.*

The considerable utility of ultrasensitive microwave radar in atmospheric studies can now be augmented by lidar and acoustic echo-sounding techniques. The current and potential capabilities and limitations of these methods of remote atmospheric probing are discussed and the techniques are compared. A remote sensing facility consisting of these instruments probing the same volume of the atmosphere can measure many of the meteorologically significant parameters necessary to increase understanding of the structure and dynamics of the clear lower atmosphere, and provide the spatial and temporal density of measurements necessary for weather forecasting. (Author abstract)

35937 **APTIC NO. 58672**

Jeffrey, R. K. and G. K. Lee

AN AUTOMATED SYSTEM FOR CONTINUOUS MONITORING OF SO2, NO2 AND NOX IN BOILER FLUE GAS. *Department of Energy, Mines, and Resources (Ottawa), Canadian Combustion Research Laboratory, Technical Bulletin TB 131, 51p., Oct. 1970. 4 refs.*

An automated system for continuously sampling, analyzing and recording sulfur dioxide, nitrogen dioxide, and nitrogen oxide levels in combustion products such as boiler flue gas is described. The system employs three parallel-connected, automated wet-chemical analyzers for monitoring each pollutant simultaneously and selectively. Each analyzer is supplied with a clean, moisture-free stream of flue gas which has been accurately diluted and blended with nitrogen to suit the concentration range of the selected methodologies. Response time between sample inlet and readout is 20 min for SO2 and 7 min for both NO2 and NOx. By continuously monitoring these emissions in flue gas it is possible to eliminate virtually all interferences and schematic errors that are inherent in batch sampling and analyses. Furthermore, the capability for detecting and recording momentary changes in emission rates of these pollutants has provided new information on the effects of both combustion conditions and fuel quality on pollutant fixation processes. (Author abstract modified)

35938 **APTIC NO. 58625**

Maykoski, Robert T. and Charles Jacks

REVIEW OF VARIOUS SAMPLING METHODS FOR SOLVENT VAPORS. *Air Force Environmental Health Lab., McClellan Air Force Base, Calif., Air Force Proj. 67M-46, Rept. 70M-4, 17p., Jan. 1970. 5 refs.*

NTIS, DDC: AD 752525

Vapors of trichloroethylene, toluene, methyl ethyl ketone, and butyl cellosolve in air were collected using Scotchpac and Tedlar bags, glass prescription bottles, and charcoal adsorption tubes. Collection efficiencies were adequate for all but butyl cellosolve. For the latter, only the bottle was acceptable. Further development studies are needed for the plastic bags. Direct reading indicator tubes were tested for trichloroethylene and toluene and provided false high readings of 105 and 190%. For better accuracy, tube calibration prior to usage is recommended. (Author abstract)

35939 **APTIC NO. 59192**

Schmidt, U. and W. Seiler

A NEW METHOD FOR RECORDING MOLERCULAR HYDROGEN IN ATMOSPHERIC AIR. *J. Geophys. Res., 75(9):1713-1716, March 20, 1970. 4 refs.*

A new method for continuous recording of the hydrogen content of atmospheric air is described. The method is based on reduction of mercuric oxide and the determination of the resulting mercury vapor by absorption in the 2537 A line. The standard error of the calibration for 0.5 ppm H2 is 3%. The limit of detection is 0.01 ppm. Preliminary results are discussed. (Author abstract)

1969

35940 **APTIC NO. 58726**

Hagopian, Miasnig

BLUE TETRAZOLIUM REDUCTION BY WHOLE TOBACCO SMOKE AND GAS PHASE COMPONENTS. *Environ. Sci. Technol., 3(6):567-569, June 1969. 11 refs.*

A simple colorimetric method was developed and applied to monitor tobacco smoke effluents. This sensitive method is based on the reduction of blue tetrazolium by constituents distributed throughout the gas phase of smoke. Data are presented to show the yield of blue tetrazolium reducing substances trapped from mainstream smoke of various commercially available cigarettes smoked by a machine under predetermined, reproducible conditions. On an equivolume basis, the reducing power in the particulate phase was approximately 10 times that of the gas phase for most brands tested. For those brands with filter tips, the total level and the proportion of blue tetrazolium-reducing substances in both phases was a very useful measure of filtration efficiency and selectivity. The blue tetrazolium method might be applied to monitor atmospheric samples in air pollution studies where smoke from incomplete combustion of natural products is a major source of pollutants.

35941 **APTIC NO. 58650**

Harding, Lynn and R. E. O. Williams

SELECTION OF STAPHYLOCCOCUS AUREUS IN CULTURES FROM AIR SAMPLES. *J Hyg., 67(1):35-39, March 1969. 10 refs.*

The use of anaerobic culture as a selective method for the isolation of airborne Staphylococcus aureus was explored. By simultaneous exposure of various culture media followed by anaerobic incubation, the S. aureus could be selectively cultured. A tryptone yeast extract medium enriched with a glucose and horse serum, incubated anaerobically at 41 C gave a good yield of Staphylococcus aureus from air samples, while suppressing the growth of 70 80% of the other airborne bacteria.

35942 **APTIC NO. 58703**

Pettitt, B. C., P. G. Simmonds, and A. Zlatkis

INFLUENCE OF DETECTOR TEMPERATURE ON SENSITIVITY OF ELECTRON ABSORBING DERIVATIVES. *J. Chromatographic Sci., vol. 7:1-6, 1969. 25 refs.*

Temperature dependency of the electron-capture detection process was investigated for a series of halogen derivatives of amines and alcohols chosen to be representative of those employed for the analysis of biologically important compounds. The mode of capture process, i.e., dissociative or nondissociative, was determined by plotting the natural log of KT to the 3/2 power versus 1/T, where K was the capture coefficient and T the temperature. The majority of derivatives examined were found to capture dissociatively; thus the maximum response occurred at 350 C. There was an overlapping of response for all derivatives except those of phenol and aniline due to the differing magnitudes of the temperature-dependency phenomena. Advantage of these phenomena may be taken by choosing a derivative which is optimized with respect to both sensitivity and resolution; it may also be possible to utilize a derivative with a temperature dependency opposed to that of interfering peaks. (Author abstract modified)

1968

35943 **APTIC NO. 58741**

Dunning, John W., Jr. and John C. Angus

PARTICLE SIZE MEASUREMENT BY DOPPLER SHIFTED LASER LIGHT, A TEST OF THE STOKES-EINSTEIN RELATION. *J. of Appl. Physics, 39(5):2479-2480, April 1968. 7 refs.*

Homodyne detection of Doppler-broadened, scattered laser light can be used for quantitatively observing diffusion coefficients of macromolecules at 25 C. The technique was applied over the temperature range 23 C to 50 C, and excellent agreement was found between measured line widths and predictions based on the no-slip Stokes-Einstein relation between the diffusion coefficient, particle diameter, fluid viscosity and temperature. This study was made using stabilized dispersions of rigid polystyrene spheres. The no-slip form of the Stokes-Einstein relation accurately describes the motion of rigid, spherical, monodisperse particles in dilute dispersions. A very important application is the measurement of diffusion coefficients of spherical macromolecules, e.g., serum albumin. Other applications include the study of soap micelles, emulsion polymerization reactions, dissolution and growth of particles, and nucleation phenomena near phase transition points.

35944 **APTIC NO. 58629**

Lang, Helen W. and Robert W. Freedman

A THREE-MINUTE GAS CHROMATOGRAPHIC ANALYSIS OF THE MAIN CONSTITUENTS OF MINE ATMOSPHERES. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Mining and Safety Research Center, RI 7696, 9p., 1968. 3 refs.*

NTIS: PB 213968

A rapid gas chromatographic method for routine determination of oxygen, nitrogen, methane, and carbon dioxide in mine atmosphere samples was developed. Analysis is accomplished in 3 min; readout appears on a single strip chart. The gas sample is split between two columns contained in separate chromatographs. A 5 A molecular sieve column separates O2, N2, and CH4; a porous polymer column separates CO2 from an air peak. Direct selective analysis of CH4 from this unresolved air peak is accomplished using a hydrogen flame ionization detector. Carbon dioxide is catalytically converted to methane and detected by the flame ionization detector. This chromatographic system employs one electronic integrator and a single pen recorder. It is efficient, rapid, and accurate for routine analyses. The concentration of each component is normally within fairly well-defined limits, CH4 and CO2 below 2%, and carbon monoxide (if present) less than 200 ppm. There is no interference with CH4 measurement in the composite peak. The system is not recommended if high concentrations of CH4, CO, or CO2 are to be analyzed routinely. (Author abstract modified)

1964

35945 **APTIC NO. 58723**

Harding, C. I., E. R. Hendrickson, B. B. Sundaresan, and G. G. Walker

A METHOD FOR MEASURING THE CONCENTRATION OF SULFUR COMPOUNDS IN PROCESS GAS STREAMS. *Am. Chem. Soc., Div. Water Air Waste Chem. Preprints, 4(2):119-131, 1964. 11 refs. (Presented before Division of Water, Air and Waste Chemistry, American Chemical Society, Chicago, Ill., Aug. 30-Sept. 4, 1964.) (Also: National Council for Stream Improvement, New York, Tech. Bull. 28.)*

A method for determining the presence of sulfur dioxide, hydrogen sulfide, alkyl mercaptans, sulfides, and disulfides is discussed. The gas is drawn through a stainless steel sampling probe with a glass wool plug to prevent the entry of particles. At the base of the probe, the flow is split to feed two absorption trains. One consists of three bubblers in series charged with sodium tetrachloromercurate to absorb SO2. The other consists of four bubblers in series with the first two being charged with cadmium chloride to absorb H2S and alkyl mercaptans, and the last two charged with benzene to absorb alkyl sulfides and disulfides. The SO2 concentration in the absorber is determined spectrophotometrically by a modification of the West and Gaeke method. The cadmium chloride absorber contents are combined, mixed, and split into two equal aliquots. The H2S content is determined by adjusting the pH of one aliquot to 0.8 by adding hydrochloric acid. The mercaptides, but not the sulfide, will dissolve at this pH. The combined sulfide and mercaptide concentration is determined on the second aliquot by placing the suspension in a wide mouth flask, evaporating the flask, adding hydrochloric acid, and proceeding in the same way as for determining H2S. The mercaptan concentration is computed by the difference. The combined concentration of alkyl sulfides and disulfides is determined by adding glacial acid, hydrochloric acid, and water to the benzene absorber. The mixture is titrated with bromate-bromide solution until the first permanent bromine color appears. This method has been field tested succesfully at several kraft pulp mills.

1963

35946 **APTIC NO. 59468**

Ingram, William T.

SAMPLING AND MONITORING INCINERATOR GASES. *In: American Public Works Assoc. Yearbook. Chicago, Ill., 1963, p. 214-217. 2 refs.*

Stack sampling and monitoring techniques for incinerator gases and particulates are reviewed. Sampling is divided into two major operations: the determination of the volume rate of flow of the gases in the stack and the collection of samples under conditions representative of the gases passing through the stack. Cross sectional area and velocity of gases must be determined to obtain volume rate of flow; and, since gas flow at temperatures found in incinerator stacks is highly turbulent, a traverse of the section is required. The test location in theory should be located in a section of straight duct with reasonably uniform flow. The sampling period should be at least 30 min for each test or longer to cover cyclic changes in charging the furnace. Monitoring of an incinerator stack in practice is somewhat limited by the equipment and instrumentation available. Methods in use include: subjective visual observation; use of a Ringelmann chart or smokescope; use of photoelectric units to estimate smoke opacity; continuous sample extracting and subsequent particle counting; and continuous sampling of a bypass stream for specific gases. Monitoring is currently used to primarily detect changes from sone predetermined base.

AIR QUALITY MEASUREMENTS

1974

35947 **APTIC NO. 58930**

Bidleman, T. F. and C. E. Olney

CHLORINATED HYDROCARBONS IN THE SARGASSO SEA ATMOSPHERE AND SURFACE WATER. *Science, 183(4123):516-518, Feb. 8, 1974. 13 refs.*

Polychlorinated biphenyls (PCB), dichlorodiphenyltrichloroethane (DDT), and chlordane concentrations were measured in air sampled from a tower on the south shore of

Bermuda and in Sargasso Sea surface water approximately 80-320 km south of Bermuda. The atmospheric chlorinated hydrocarbons appeared to be gaseous, and the DDT concentration was two orders of magnitude higher than previously reported particulate values. Concentrations in marine and continental air ranged from 0.21-9.4 ng/cu m for PCB, 0.008-0.090 for DDT, and less than 0.005 to 0.25 ng/cu m for chlordane. Values for PCB and DDT in the surface microlayer (150 micron) indicated enrichment relative to the concentrations in water at a depth of 30 cm. Atmospheric residence times for PCB and DDT of 40-50 days, calculated from the concentrations in the air and water, were 20 times less than values previously estimated for DDT from rainfall and DDT production data. (Author abstract modified)

35948 **APTIC NO. 58919**

Derham, R. L., G. Peterson, R. H. Sabersky, and F. H. Shair

ON THE RELATION BETWEEN THE INDOOR AND OUTDOOR CONCENTRATIONS OF NITROGEN OXIDES. *J. Air Pollution Control Assoc., 24(2): 158-161, Feb. 1974. 12 refs.*

Simultaneous measurements were made of the concentrations of nitric oxide, nitrogen dioxide, and carbon monoxide inside and outside of a building located in the Los Angeles area which is heavily polluted by photochemical smog; experiments were conducted at a time of the year when the pollutants in question tend to be high. A direct relationship was indicated between the inside and outside concentrations, and phase lag between the concentrations depended principally on the ratio of the building volume to the ventilation rate. Peak concentrations of the pollutants outside the building seemed to be related to rush-hour traffic, although these concentrations did not follow the same pattern every day. Indication was given of the possibility for reducing in concentration peaks inside the building by the lowering of ventilation rates during these periods. Nitric oxide and ozone did not appear to coexist indoors, except in very small quantities; and the indoor pollution problem for NO, NO2, and CO did not seem to be as severe as that for ozone. (Author abstract modified)

35949 **APTIC NO. 58327**

Endo, R. and T. Kohgo

THE STATE OF AIR POLLUTION IN HOKKAIDO -- SAPPORO AND MURORAN. *(Hokkaido ni okeru taiki osen no genjo -- toku ni Sapporo-shi Murooran-shi ni tsuite). Text in Japanese. Kuki Seijo (Clean Air- J. Japan Air Cleaning Assoc., Tokyo), 11(7):23-36, Jan. 1974. 17 refs.*

The air pollution in Sapporo and other cities in Hokkaido is mostly caused by heating in winter. The air in Sapporo was contaminated by sulfur dioxide and smoke emitted by boilers in many buildings in the winter until 1970. Since 1971 the SO2 concentrations have decreased because of the law prohibiting the use of heavy oil containing over 1.2% sulfur in the area within 36 sq km of a city. Central heating was begun in the 1 sq km central area. The air pollution in Muroran was chiefly caused by industrial emission from two iron works and a cement plant. The west northwest wind prevailing in the winter caused the leeward area of the industrial district to be heavily polluted. The SO2 concentrations have decreased remarkably since 1970 due to the use of low-sulfur fuel oil and improvement in equipment. The SO2 concentrations in each of the cities were measured and compared with the new environmental standard as amended in May 1973. They were almost all over the value.

35950 **APTIC NO. 58929**

Goldstein, Inge F., Leon Landovitz, and Gloria Block

AIR POLLUTION PATTERNS IN NEW YORK CITY. *J. Air Pollution Control Assoc., 24(2):148-152, Feb. 1974. 8 refs.*

Preliminary analyses of data selected from three years of smoke shade and sulfur dioxide measurements from the forty air monitoring stations in New York City were performed in an effort to investigate the spatial-temporal variation in concentration of these pollutants throughout the five boroughs of the city and to determine whether readings at one station in New York City can adequately represent the air pollution exposure for the population in the five boroughs. Interstation correlations were not high enough to justify the use of one central pollution measuring station as representative of a large metropolitan area. Sulfur dioxide correlated better between stations than smoke shade, and this may reflect the different nature and spatial distribution of sources of the two pollutants. Close proximity of stations or the fact that they were at similar heights above street or sea level did not necessarily lead to higher correlation coefficients. (Author abstract modified)

35951 **APTIC NO. 58308**

Healy, T. V.

AMMONIA AND RELATED POLLUTANTS AT HARWELL. *Atmos. Environ., 8(1):81-83, Jan. 1974. 19 refs.*

Ammonia, ammonium ion, and in some cases sulfur dioxide and smoke levels, were measured in air samples taken over periods of about an hour. Several continuous sampling runs, normally of a few days duration, were made. Visibilities and other meteorological information were included. The variation in pollutant levels confirm the value of hourly measurements. Characteristic features of the pollutants, such as peaks, seldom coincide in time, but fair to good correlation coefficients between NH4, SO2, and smoke levels indicate the existence of common controlling factors. Ammonium and smoke levels give good correlations with inverse visibility over a series of relative humidity ranges. (Author abstract)

35952 **APTIC NO. 59121**

Lonneman, W. A., S. L. Kopczynski, P. E. Darley, and F. D. Sutterfield

HYDROCARBON COMPOSITION OF URBAN AIR POLLUTION. *Environ. Sci. Technol., 8(3):229-236, March 1974. 11 refs.*

Air samples were collected at sites in Los Angeles and New York to evaluate compositional details of the hydrocarbons and nitrogen oxides. The compositional details provide a wealth of information allowing for the estimation of source contribution and photochemical potential of an ambient atmosphere. The need to inventory an ambient atmosphere for source contribution is important for evaluating control strategy required to meet the 1975 air quality standards. Two methods for estimating vehicular hydrocarbons in the ambient atmosphere are described. Gas chromatography was used to divide the HC into C2-C5 aliphatic hydrocarbons (excluding C4 olefins), C4-C8 aliphatic hydrocarbons, and C6-C10 aromatic hydrocarbons. Average HC ratios to acetylene in the Lincoln Tunnel were also determined. The ratio of the sum of paraffins, olefins, and aromatics to acetylene at New York and New Jersey stations was determined for 7-9 am and at all times. The average total hydrocarbons for each station at various times of day were also determined and correlated with vehicular traffic. The effect of wind direction on pollutant ratios, the diurnal patterns of HC, oxidant, and NOx, and emission factors, and % contribution of vehicular emissions to pollutants in downtown Los Angeles are discussed. (Author abstract modified)

35953 **APTIC NO. 58491**

Meszaros, Agnes and K. Vissy

CONCENTRATION, SIZE DISTRIBUTION AND CHEMICAL NATURE OF ATMOSPHERIC AEROSOL PARTICLES IN REMOTE OCEANIC AREAS. *J. Aerosol Sci., 5(1):101-109, Jan. 1974. 12 refs.*

Samples of atmospheric aerosols were taken over the oceans of the Southern Hemisphere with membrane filters. The total number concentration of particles was also measured. These samplings and measurements were carried out during the summer of 1971-1972 on board a Soviet research ship. The membrane filter samples were evaluated by electron and optical microscopy in the size range of 0.03-64.0 micron in radius. The chemical nature of the particles was determined by morphological identification. Aerosol particles consisted mainly of ammonium sulfate, sea salts, and a mixture of these materials. The presence of sulfuric acid occurred in some cases. The maximum size distribution was 0.07-0.1 micron. The total aerosol (Aitken) concentrations were about 2/3 of the values measured over the North Atlantic Ocean. The particle concentration around the maximum in size distribution was an order of magnitude smaller than that observed over the North Atlantic. The chemical composition was similar to that over the North Atlantic. (Author abstract modified)

1973

35954 **APTIC NO. 58427**

Ando, Asahiro, Kenichiro Terai, and Yoshikazu Nasu

AIR POLLUTION BY FLUORIDE IN HOKKAIDO TOMAKOMI DISTRICT. *(Hokkaido Tomakomai chiku ni okeru fukkabutsu osen ni tsuite (Daiippo)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):495, Oct. 1973. (Presented at the Japan Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 225.)*

As a preliminary study for an estimation for the proposed industrial site east of the present Tomakomai industrial belt, where annual production of one million tons of aluminum is expected, the extent of the present fluoridy pollution was investigated. The F content in the air was measured by the Hokkaido Government using alkaline filter paper, and the F content in plants was studied in red clover collected in July, August, and September of 1971 and 1972. The fluoride content in clover and the distance and direction from the emission sources showed direct linear relationships. The measurements by alkaline filter paper and the fluoride content in clovers agreed well, and the correlation was 0.981. Southeastern and southwestern winds dominate in summer in the area and fluorides disperse inland; seasonally it coincides with the period of plant growth. High F contents in plants extended 6 km to north and 2 km to east and west from the emission source.

35955 **APTIC NO. 58998**

Barthelemy, F.

AIR POLLUTION IN THE LYON AGGLOMERATION. *(La pollution atmsopherique de l agglomeration lyonnaise). Text in French. Ann. Mines (Paris), Nov.-Dec. 1973:103-114, 1973.*

Results of systematic sulfur dioxide and dust concentration measurements, performed in the Lyon urban and industrial agglomeration, and possibilities for SO2 emission abatement in that area are described. The yearly average SO2 and dust concentrations, measured between 1967 and 1972, are 71-110 micrograms/cu m and 57-67 micrograms/cu m, respectively. The SO2 and dust concentrations were 2.9-3.3 times and 2.7-3.3 times higher during winter than they were in the summer. The SO2 and dust concentrations were highest during January, and lowest during June and August. The increase in the average SO2 and dust concentrations in 1971 after the steady decline since 1963 was due to unfavorable meteorological conditions. The yearly average concentration of SO2 around a thermal power plant was 70 micrograms/cu m, with daily peaks of 500 and over 1000 micrograms/cu m. The SO2 emissions in the city and in its suburbs are 100 tons/day and 200 tons/day, respectively, in winter. The industries and power plants in the suburbs have little influence on the SO2 concentrations in the city. An automatic SO2 monitoring system, to be installed in the near future, will give an alarm and require the usy of low-sulfur fuel during unfavorable meteorological situations.

35956 **APTIC NO. 58373**

Chiba, Shojo, Yoshio Saiki, Yasuji Himi, and Saburo Kanno

MEASUREMENT OF ODOR AROUND STOCK FARMS. *(Chikusanjo shuhen ni okeru adkushu sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):378, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 128.)*

The odor intensities and dispersion of odor were investigated at representative stock farms. Ammonia was analyzed by indofenol; hydrogen sulfide by methylene blue; trimethylamine by gas chromatography, and odors were graded into six intensities. The diffusion pattern was investigated with NH3. The detection thresholds were 0.01 ppm for NH3, 0.01 ppm for H2S, and 0.001 for (CH3)N. The intensities were grade 4 at the hog farm and the chicken farm, and grade 5 at the cattle dairy farm and the animal offal processing plant. At the hog farm, NH3 measurement was 0.38 ppm and H2S 0.01 ppm; at the chicken farm, NH3 was 0.57 and (CH3)3N, 0.018; at the dairy farm, NH3, 9.9, and (CH3)3N, 0.019; and at the processing plant, NH3, 0.32 and (CH3)3N 0.012 ppm. At all farms and plants, NH3 odor was present not only in the farm but at the borderlines; the processing plant had 0.002 ppm of (CH3)3N at the borderline and the hog farm had 0.01 ppm of H2S at the borderline. Regression formulas for NH3 odor are presented.

35957 **APTIC NO. 59269**

Court, J. D.

AIR QUALITY--NOW AND THE FUTURE. *Aust. Refrig. Air Cond. Heat., 27(6):18-20, June 1973. (Presented at the AIRAH Conference, Sydney (Australia), 1973.)*

Methods for monitoring air pollutants and trends in their level of concentration are reviewed for the territory of New South Wales, Australia. Three indicators of air pollution which have been monitored on a regular basis at a large number of sites in N.S.W. for many years are: smoke concentration or suspended matter, sulfur dioxide, and dust deposition or fallout. The filter paper method with results expressed in units such as Coefficient of Haze has been universally adopted for measuring suspended particulates; the older method of measuring light transmission has recently been replaced with one measuring light reflectance. Sulfur dioxide is measured by absorption in hydrogen peroxide and back titration, while dust deposition is measured in standard deposit gauges. Smoke and sulfur dioxide measurements have indicated levels in the N.S.W. which are for the most part reasonably below the World Health Organization s recommended maximum limits, and a downward trend in Sydney and Newcastle has been noted for dust deposition. The carbon monoxide level which has been monitored continuously via nondispersive infrared spectrometry since 1970 appears to be unacceptably high in the Sydney central business district; until legal steps can be taken to control its emission from motor vehicles, building air intakes will have to be positioned as far as possible from traffic movements. Ozone measurements via chemiluminescent methods have also shown unacceptably high values and indicate that Sydney has a potential photochemical pollution problem.

35958 **APTIC NO. 58496**

Eguchi, Ikuo, Toru Nunokawa, Shintaro Sueta, Kenichi Shimohara, Kimiko Tatsuno, Teiji Hori, Nobuyashi Shigemori, and Takashi Akiyama

ON METALLIC CONTENTS OF SUSPENDED PARTICULATES IN KITAKYUSHU CITY (2). *(Kitakyushu-shi ni okeru fuyu funjinchu no kinzoku seibun ni tsuite* *(daniniho)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):326, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 253.)*

Eight high vol-samplers have been operating since August 1970 at various locations in Kitakyushu and monthly samples are taken for atomic absorption spectrophotometry of metal contents. The relationships among metal contents such as iron, manganese, lead, chromium, cadmium, and vanadium are regularly checked as reported in previous reports. Suspeded particulates and Fe, Pb, Mn, Cr, and V showed high correlations in the analyses up to July 1973. Especially Fe, Pb, and Mn showed even higher correlation with dusts than in the previous report. Correlation between Fe and Pb was 0.879, and that between Fe and Mn was 0.905.

35959 **APTIC NO. 58505**

Ferrari, L. M.

OZONE OBSERVATIONS IN THE SYDNEY REGION. *Clean Air J. (Clean Air Soc. Australia New Zealand), 7(4):69-73, Nov. 1973. 13 refs.*

Photochemical smog in Sydney is a cause of ozone and oxidants in the area. Oxidants were measured continuously since Dec. 1971. Average diurnal ozone concentrations, variations in daily ozone concentrations, monthly O3 averages, maximum hourly averages, and ozone concentrations at different locations were measured. Ozone concentration during the day was lowest just before sunrise and increased gradually to a maximum about midday, and then gradually deteriorates. The ozone peak during the day is probably a result of the reaction of emissions from automobiles with ultraviolet light. Meteorology influenced O3 concentrations, since high values usually occurred on days of relative calm. The yearly average in 1972 was 1.5 pphm, with maximum hourly averages greater than 25 pphm. Hydrocarbons were also monitored, and the changes in O3 were compared to the changes in HC. The effects of high O3 concentrations on plants and animals are mentioned.

35960 **APTIC NO. 58548**

Fujie, Kimiko

CONCENTRATION OF SULFURIC ACID AEROSOL IN URBAN AIR. *(Osaka ni okeru ryusan misuto no sokutei kekka ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):353, 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 97.)*

Measurements of sulfuric acid mist were taken at five locations in Osaka between Nov. 1971 and July 1973. Samples were taken by FNS-type air samplers and filter paper and were analyzed by the Commins method. High monthly averages were generally found between June and October, with some cases of localized high averages in February and April. The highest monthly average for the period was 25.2 micrograms/cu m in August, taken at a junior high school; the averages at other locations for the same month were 16.0, 16.8, 18.7, and 19.1 respectively. Some drastic local differences were noted in February 1972, when the monthly averages were 3.8 and 5.1 in other locations, and at the Osaka Women s College, 16.9 micrograms. This last location tended to be high in other months also. The correlation coefficients of sulfuric acid mist and sulfur oxides, dusts, nitric oxides, nitrogen dioxide, carbon monoxide, total hydrocarbons, saturation hydrocarbons, oxidants, and ultraviolet radiation are presented.

35961 **APTIC NO. 58368**

Fujii, Toru, N. Tajima, Kenichiro Yoshimura, Kaori Inoue, Keisuke Taguchi, Fujihiko Kure, Yoshinori Nishikawa, and Kenji Oka

STUDIES ON THE AIR POLLUTION BY EXHAUST GASES OF AIRCRAFT (1). *(Kokuki haigasu ni yoru taiki osen ni kansuru kenkyu (1), Kuko shuhen ni okeru taiki osen no jittai). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):515, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 245.)*

To investigate air pollution by aircraft exhaust gases, various measurements were taken in the runway of an airport. Carbon monoxide, sulfur dioxide, suspended particulates, nitrogen oxides, aldehydes, and hydrocarbons were measured, meteorological conditions were checked, and departing and landing aircraft were counted. The periods of investigation were 5 days each in summer and winter. The average measurement of SO2 in winter was less than 0.03 ppm-0.17 ppm; and less than 0.02-0.03 ppm in summer. The number of aircraft landing per hour was between 8 and 18 in winter and 7 and 18 in summer. The amount of carbon monoxide ranged from zero to 3 ppm in winter and zero to 4 ppm in summer; suspended particulates were 80 to 380 micrograms/cu m in summer.

35962 **APTIC NO. 58423**

Hashimoto, Yoshikazu, Sadayuki Ishimama, and Masakazu Wakayu

MEASUREMENT OF CYANIDE IN JET ENGINE EXHAUSTS. *(Jetto enjin (JT3D)9D) no haigasu-chu no shian no bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):458, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 192.)*

Cyanide compounds that are contained in the exhaust gases from airplane gas turbines were measured using DC-8 and Boeing 744 engines. An improved pressure measurement probe fork was used for sampling the exhaust gas of the jet engine. Both stainless and teflon tubes were used. The exhaust gas was led into a mylar bag through these tubes and then removed 5 l/min, put through a G-2 sinter glass filter, and absorbed by 5 N sodium hydroxide solution. The JT9D engine gas was filtered through a member filter and absorbed in the solution. Measurements of CN from each driving mode are presented in a table. The average CN emission during idling was 260 micrograms/cu m for JT3D (260 also for JT9D), during landing was 110 micrograms/cu m (98), during ascending 150(120), and for departing 84 (52). The most important interference is caused by S2; in this case, it was masked successfully by absorbance of lead acetate.

35963 **APTIC NO. 58803**

Hayashi, Eiji, Masamichi Hara, and Saburo Hayashi

RESEARCH ON THE MEASUREMENT OF THE PARTICULATES (VI). *(Taikichu fuyu funjin sokutei ni kansuru kenkyu (Dai4-ho)-FKS lowvol. no ichinenkan renzoku hoshu kekka). Text in Japanese. Taiki Osen Keknkyu (J. Japan. Soc. Air Pollution), 8(3):518, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 248.)*

Three low-vol samplers were at three locations in Amagasaki and the measurements of suspended particulates were continuously taken for 380 days, between June 1971 and July 1972 in segments of 10 days each. The total dusts, lead, cadmium, iron, manganese, and copper were analyzed and the composition ratios of each element were examined in relation to the location of samplings. The ratios of metal concentrations were largest in the order of Fe, Pb, Mn, Cu, and Cd. Both the total dusts of metals and the ratios of metals were greatest in the order of south, central, and north Amagasaki. The average daily measurement of dusts in south Amagasaki was 83 micrograms/cu m, Pb; 0.37 micrograms, Cd; 0.009, Fe, 1.161; Mn, 0.22; and Cu, 0.08.

35964 **APTIC NO. 58554**

Himeji, Heitaro, Tojiro Ito, Kikuzo Yamamoto, Hiroshi Wakae, Yukio Ishigaki, Tadashi Tatsumi, Nekiro Azuma, and Kiyotsugu Nishida

AIR POLLUTION IN SUMIYOSHI-KU OSAKA CITY. *(Sumiyoshi-ku ni okeru taiki osen no genjo ni tsuite--fukugo osen ni kansuru kosatsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):504, 1973. 3 refs. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 234.)*

The air quality was measured in the Sumiyoshi district, Osaka, where steel and veneer industries plants are clustered with homes. The measurements of sulfur oxides and suspended particulates are presented. The SOx measurements between 1969 and 1972 show that the air quality is slowly improving; the year s average in 1969 was 0.06 ppm, and them improved to 0.055, 0.049, and 0.039 ppm each year. Generally, the measurements during winter months tend to be high. Monthly suspended particulates in the district ranged from 0.1 mg to 0.229 mg, with the year s average equal to 0.15 mg, whereas the total city averages ranged from 0.064 to 0.131, with the year s average equal to 0.1 mg. The effects of the complex pollution from all sides are extremely bad, and complaints are constantly heard from the residents. But the majority of industrial plants are owned by small and medium size industrialists who are not equipped financially for large scale improvements.

35965 **APTIC NO. 58848**

Himi, Koji

AIR POLLUTION TODAY AND FUTURE IN BIG CITIES AND THEIR VICINITY. KEIHIN DISTRICT. *(Daitoshi to sono shuhen chiiki ni okeru taiki osen no genjo to shorai). Text in Japanese. Bosei Kanri (Rust Prev. Contr.), 17(2):13-25, Feb. 1973. 14 refs.*

Air quality measurements were taken in the Keihin district. Major pollutants were fly ash, smoke, and suspended dusts before 1954, but sulfur dioxide, nitrogen dioxide, and hydrocarbons have become more prevalent today. Pollutants are emitted from furnaces and boilers in various industries where 7,390,530 kl of heavy oil and 2,279,590 tons of coal were consumed in 1970. Dust emissions have been decreasing because of fuel changes from coal to oil and the development of dust collectors. Chemical composition of the dusts for the whole area includes silicon dioxide and sulfate anions; iron, manganese, calcium, titanium, and chromium are found in the industrial areas; and nickel and vanadium appear in the non-industrial areas. Peak concentrations of suspended particulates occur at 8 am and 5 pm. The mean concentration is 200-400 micrograms/cu m in the industrial area and 100 micrograms/cu m in non-industrial areas. Main constituents of these particulates are soot, sulfur compounds, and free sulfuric acid. Although the S2 content of oil used has been decreased to about 1%, the total consumption of oil reached 7 million tons/yr and about 0.1 million tons of SO2 were released in this district in 1970. Emissions of SO2 and ambient concentrations are monitored continuously. Photochemical smog episode are frequent.

35966 **APTIC NO. 58302**

Hishida, Kazuo, Hisao Nihei, Kazuo Morita, and Shozo Nakao

EMISSION FACTORS FOR STATIONARY SOURCES (PART 3). *(Emisshon fakuta ni tsuite, kotei hasseigen (sono 3)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):368, 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 110.)*

Emission factor indexes for hydrocarbons were examined with regard to various types of printing and coating industries and storage installations. Emission factors (E.F.) were calculated by the following method: emission gas sampling, measurement of gas concentration, unit time emission gas quantity, unit time HC emission quantity, unit time material consumption quantity, and HC emission quantity per material consumption unit. Emission factors in the printing industries ranged from 432 for metal plate printing to 20.1 for offset; in coating industries, 100 for airspray and 29.7 for baked surface coating; for storage, 0.677 kg/kl for fuel oil storage tank and 1.26 for gasoline stand. The limited data and great fluctuations in the result make further study a definite requirement.

35967 **APTIC NO. 58303**

Hishida, Kazuo, Hisao Nihei, Kenji Ikeda, Urara Sano, Kazuya Hayakawa, and Kunio Yamakawa

STUDIES ON AIR POLLUTANT EMISSION RATIO OF EACH SOURCE IN TOKYO. *(Tonai no osen busshitsubetsu kiyoritsu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):369, 1973. (Presented at the Japan. Soc. Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 111.)*

The fixed sources of pollution emission in Tokyo were divided into factories and workshop buildings (includes sanitation plants), and mobile sources were divided into automobiles and trucks, and the total emissions were calculated by categories and compared. Sulfur oxides and dusts were mostly emitted from fixed sources, and carbon monoxide, hydrocarbons, and aldehydes were emitted predominantly from mobile sources. Nitrogen oxides were emitted 31.3% from fixed sources, and 68.7% from mobile sources. The metropolitan 23 districts were divided into grids and each segment was given one of three levels of emission intensity, and maps for SOx, NOx, and CO were prepared. More than 200 ton/year of SOx included 54 mesh segments of factories and 8 mesh segments of workshops. For NOx, more than 200 ton/year emission sources were 22 mesh segments from fixed sources, and 71 mesh segments from mobile sources. For CO, 85 mesh segments were dominated by automobiles emitting 1000 ton/year, and 76 by trucks.

35968 **APTIC NO. 59101**

Hishida, Kazuo

ENVIRONMENTAL STANDARD, EMISSION STANDARD AND AIR POLLUTION CONTROL PLAN IN TOKYO. *(Tokyo-to ni okeru kankyo kijun, haishutsu kijun to taiki osen boshi keikaku). Text in Japanese. Kuki Seijo (Clean Air-J. Japan. Air Cleaning Assoc., Tokyo), vol. 11 suppl.:1- 31, Nov. 1973.*

Emission factors are calculated for sulfur oxides, nitrogen oxides, carbon monoxide, hydrocarbons, aldehydes, smokes, and dusts for furnaces and automobiles. Automobile emission factors were calculated for a six-mode driving test. Using the figures for air pollution sources in the 1972 fiscal year and the calculated emission factors, the total amount of each pollutant emitted is estimated. The total amount of each pollutant is predicted for the 1973 fiscal year, taking into consideration the changes in fuel consumption. The calculations presented differ from the published values of the Environmental Agency. The total amount of NOx was 96,364 tons/yr in 1972, 69% of it due to automotive exhausts and 31% from fixed sources. Environmental Agency figures are 53.4% from automobiles and 46.6% for industry. Air pollution in Tokyo is discussed.

35969 **APTIC NO. 58561**

Honda, Eri

ENVIRONMENTAL ENGINEERING STUDIES OF MICROBIOLOGICAL CONTAMINATION CONTROL OF INDOOR-AIR. THE AIRBORNE-BACTERIAL CONCENTRATIONS AT OSAKA UNDERGROUND SHOPPING CENTERS. *(Shitsunai kuki no saikin osen ni kansuru kankyo kogakuteki kenkyu - Osaka chikagai kan-*

kyo ni okeru kuchu saikin). Text in Japanese. Kuki Chowa, Eisei Kogaku (J. Japan Soc. Heating, Air Conditioning, Sanitary Eng.), 47(12):1125-1135, Dec. 1973. 10 refs.

The microbiological contamination of the air in four underground shopping arcades in Osaka was investigated. Bacteria in the air were sampled by pinhole sampler; settling bacteria were captured on petri dishes of 9 cm diameter for 5 min at 40 cm from the ground; bacteria on the floor were sampled by an absorbent gauze soaked in biological saline water applied to wipe off a metal frame. All bacteria were cultured in gelatine, for 48 hours, at 37 C, and the colonies were counted. In addition, the number of pedestrains, their walking speed, and the temperature and humidity of shopping arcades were measured. The investigations were conducted in the summer and winter. Bacteria particle sizes, and per person bacterial emission quantities were calculated. The bacterial concentration in the air varied from hour to hour. Both the number of pedestrians and their walking speeds influenced the variation of the bacterial concentration. The bacterial concentrations in the air were greater in summer than in winter. The bacterial concentrations in the air supply were influenced by the rate of ventilation. The Stokes diameter of bacterial particles was 14.5-22.5 micron, when the specific weight of a particle was 1. The relationship between bacteria settled on the floor and suspended bacteria was not clear.

35970 APTIC NO. 58425

Honma, Katsunori, Kikuo Oikawa, and Toshio Kimoto

ELECTRON MICROSCOPIC OBSERVATION AND MEASUREMENT OF MASS CONCENTRATION OF PARTICULATE MATTERS IN JET ENGINE EXHAUSTS. *(Jetto enjin (JT-3D, JT-9D) haigasu no sokutei (6), ryushijo busshitsu no keitai oyobi nodo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):459, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 193.)*

The morphology and weight concentration of particulate pollutants emitted from a jet engine were studied. The particulates were captured directly on the sheet mesh of electron microscope, using an electrodynamic impactor. The particulates emitted during idling and departure were examined. As far as the material of particulates were concerned, there was not much difference. They both contained collections of carbon particulates, grease, and a crystal line material. However, idling particulates suggested that some condensation and dehydration might have occurred when the exhaust gas was sucked into the leader pipe from the Pt-7. The departure exhaust contained many coagulations of microparticles, composed of minerals or heavy metal fumes and salts of heavy organic solid material; when they came under the strong electron irradiation in the microscope, they tended to evaporate. The average emission concentration of a jet engine ranged from 1.21 mg/cu m to 12.60 mg/cu m.

35971 APTIC NO. 58549

Hosokawa, Yoshioki, Shiro Izumi, Masataka Chinzu, Takeshi Yoshida, Susumu Hayakari, and Kaku Seki

RESEARCH ON REGIONAL REPRESENTABILITY OF ATMOSPHERIC SO2 CONCENTRATION IN HACHINOHE CITY. *(Hachinoe-shi ni okeru aryusan gasu nodo no chiiki daihyosei ni kansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):506, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 236.)*

Hachinoe has a population of 209,000 and contains an industrial belt of electric power plants, iron and steel industries, non ferrous metal refining and fabrication industries, and pulp mills in its 213 sq km area. The total sulfur dioxide emission in the city is 1414 N cu m/hr by the 1972 investigation. In winter, the northwest wind velocity 4-6 m/sec tends to create a high concentration pollution area in the northeastern part of the city, but the summer sea breeze creates only light concentrations of pollutants in the land area. Significant correlations of various measuring points in the city are presented by maps and tables. The annual SO2 concentration distribution pattern and the hourly concentration distribution in the danger wind of NW were mathematically calculated and formulas were obtained.

35972 APTIC NO. 58926

Igarashi, Nobuo, Tadao Suzuki, Toru Imai, and Yoshio Komaki

FIELD SURVEY BY SMOG CHAMBER MOBIL (III). *(Ido sumoggu chanba ni yoru firudo sabe (dai-3-po)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):563, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 286.)*

Using a mobile smog chamber, the air on the loup line in the Suginami area in Tokyo was sampled during the morning rush hours on 18 days between July 11 and August 16, 1973. Hydrocarbon analysis, ultraviolet irradiation, and photochemical changes of HCs were examined. The irradiation intensity was 9.5 mm/sq cm, the chamber temperature, 30-35 C, and analyses were given at the beginning of irradiation, 1 hr later, and 2 hr later. Fifty l of the air were concentrated by an odor concentration apparatus and applied to gas chromatography. Concentrations of HC varied depending on the wind direction and speed, but all 18 samples showed similar patterns with high peaks of propane-propylene, toluene, ethane-ethylene, iso-butane, and iso-pentane, in that order. The HCs were reduced by irradiation, but the reduction of toluene was particularly notable.

35973 APTIC NO. 58829

Imai, Sakingo, Shiro Furuya, Munehiro Warashina, and Yuzuru Kusaka

EMISSION SPECTROPHOTOMETRIC DETERMINATION OF TRACE ELEMENTS IN AIR POLLUTANTS OF KOBE AREA. *(Kobe shinai taiki fuyu ryushijo busshitsu no hakko bunko bunseki-biryo kinzoku genso no sokansei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):439, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 173.)*

Analysis of suspended particulates by emission spectrophotometry was conducted, and 13 kinds of traceable elements were quantitated. The method was applied for the air quality analysis at five locations in Kobe between Jan. and Dec. 1972, and seasonal fluctuations, geographical differences, and the correlation coefficient between elements were investigated. Chromium, tin, titanium, and vanadium had peaks in March, June, and October. Silver, cadmium, copper, iron, manganese, nickel, lead, and zinc had peaks between April and June, and in December. Correlation coefficients of more than 0.75 were noted for Fe with Mn, Ni, and Pb; for Cd with Fe and Ni; for Me Fe and Ni; for Ni Cd, Fe, Mn, Pb, and Zn; for Pb with Fe and Ni; and for Ti with V. A significant find was that aluminum behaved differently than any other elements.

35974 APTIC NO. 58390

Inoue, Tsutomu, Koichi Oda, Toshihiko Inoue, and Hiroshi Nakano

A STUDY OF AIR POLLUTION FROM VEHICLE EXHAUSTS. *(Osaka-shi ni okeru jidosha haishutsu gasu osen no jittai to sono ichikosatsu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):511, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th Fukushima, Japan, Nov. 6-8, 1973, Paper 241.)*

As a followup study of the 1971 investigation of automotive exhaust gases in Osaka, carbon monoxide concentration measurements were taken at 150 locations including 68 intersections, 34 high-speed expressway points, and 48 back streets, by simple bag sampling. The measurements were taken by non-dispersive infrared analyzer. The maximum measurement was 19.5 ppm in front of the Osaka Central Post Office, and 22 intersections, five expressway points, and two back streets exceeded 10 ppm but did not reach 20 ppm. The measurements tended to exceed 10 ppm at the same locations as those exceeding 10 ppm in 1971.

35975 **APTIC NO. 58340**

Itakura, Jun, Takatoshi Tajima, Shinji Kubo, Kazuo Fujisaki, Moritsuga Kitamura, Michikazu Sawada, Chie Nakagawa, and Tetsunobu Taira

STATISTICAL PREDICTION OF SOX CONCENTRATION (PBO2 METHOD) AND SEDIMENTED DUSTS. *(Koka baijinryo to io sankabutsu nodo (PbO2 ho) to tokeiteki yosoku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):401, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 139.)*

Using an addition model of statistical prediction, with a revision and adjustment by the multiplication type model, predictions of settling particle quantity and sulfur oxide concentration by mobile mean ratios were attempted. By analyzing significant time successions, the patterns of trend fluctuations and seasonal fluctuations were examined. Actual figures and logarithms were used, and the accuracies were compared. For settling particles, actual figures yielded more accurate predictions, and for sulfur oxides, the use of logarithm was more dependable. The methods and actual predictions of parts of Kanazawa are presented up to June 1975.

35976 **APTIC NO. 58418**

Ito, Michio, Kiyoshi Tsuchida, Shoji Ito, Haruhiko Yoshinari, and Noriyasu Imai

VARIATION OF POLLUTANTS IN PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu hasseiji ni okeru osenshitsu no doko). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):444, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 178.)*

Using the air pollution data in Chiba prefecture of the period 1971-1973, the formation of high oxidant concentration, the behavior of other pollutants during high oxidant concentration, the ratio of nitric oxide and nitrogen dioxide, and the concentrations of dusts, nitrate radicals, and sulfate radicals for such periods were studied. The appearance of more than 0.1 ppm of oxidant and hourly averages were plotted, and the fluctuations of NO, NO2, hydrocarbons, dusts, and sulfur dioxide for the same periods were plotted. The peak of NO appeared from 6-8 am on the days of high oxidant concentrations; NO2 reached the peak two hours before the oxidant concentration peaks and then gradually decreased. The HC showed no special relation with oxidants, and had its own special patterns. Dusts reached the peak about 2 hr before the oxidant peak, and the maximum concentration was approximately two times that of normal days. The concentration of SO2 also increased sharply when oxidant concentration was high.

35977 **APTIC NO. 58997**

Izumikawa, Sekio, Kunihiko Asakuno, Nobuo Ito, Masanao Funeshima, Tomio Hiroo, and Toshio Odaira

STUDY OF PAN PRODUCT MECHANISM BY CONTINUOUS MEASUREMENT. *(Renzoku sokutei ni yoru PAN seisei yoin no kaiseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):565, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th Fukushima, Japan, Nov. 6-8, 1973, Paper 288.)*

The peroxyacetyl nitrate concentration has been continuously measured since 1971 by experimental equipment at the Tokyo Metropolitan Environmental Protection Research Inst., Rissho High School (12 km from the Inst.) and Aome (50 km from the Inst.) The time change patterns of ozone and PAN approximately follow the same course. At 8 am PAN is approximately 1 ppb, 3 ppb at 10 am, 7 ppb at 11 am and reaches the peak at noon at 8 ppb; the concentration stays at the level of about 7 ppb until about 3 pm and drops drastically to 3 ppb about 4 pm and down to 1.5 ppb about 7 pm. The O3 concentration starts about 2 pphm at 8 am goes up to 6 pphm about 10 am, 14, about 11 am, and stays at the same level until 2 pm, 10 pphm about 3 pm, 6 about 4 pm, and back 2 pphm about 8 pm. The ratio of PAN to O3 were, at the three measurement locations, 10%, 5%, and 3%, and PAN ratio was higher when primary pollutants of nitrogen oxides and hydrocarbons were higher. When ultraviolet ray intensity is high (usually between noon and 3 pm), the ratio of PAN/O3 is high. In Aome, the PAN/O3 ratio between noon-2 pm is 2-3%, but with the drastic increase of O3 at 3 pm, the ratio rises to 6%. This is probably caused by the transport from central Tokyo.

35978 **APTIC NO. 59132**

Kerteszne-Saringer, Magdolna, Zoltan Morlin, Katalin Kollar, and Janosne Rako

AIR POLLUTION WITH POLYCYCLIC HYDROCARBONS FROM VEHICULAR TRAFFIC IN BUDAPEST. *(A levego kozlekedes eredetu policiklikus szenhidrogen szennyezodese Budapesten). Text in Hungarian. Energia Atomtech. (Budapest), 26(10):461-469, 1973. 7 refs.*

A comparative quantitative and qualitative study of polycyclic aromatic hydrocarbons at three sites with heavy traffic and another site with low traffic density is described. The polycyclic aromatic hydrocarbon concentrations in the air were higher at the sites with heavy traffic than they were at the site with low traffic density throughout the year. The concentrations measured at the latter site in winter were lower than those measured at the sites with heavy traffic in winter. Contrary to the daily variation pattern of other traffic-generated pollutant concentrations, both the polycyclic aromatic hydrocarbon and carbon monoxide concentrations measured at the sites with heavy traffic had their maxima during the evening hours. At the sites with heavy traffic, and during the winter period, 20-methylcholanthrene, coronene, and 1,2,3,4-dibenzopyrene showed increased relative frequency of occurrence compared with the data for the site with low traffic density, which demonstrates that these compounds originate from automobile exhaust. While the 3,4-benzopyrene concentrations could not be correlated to the corresponding concentrations of the other polycyclic aromatic hydrocarbons for the site with low traffic density, correlation factors of 0.75, 0.50, 0.67, 0.56, 0.61, 0.70, and 0.75 between the concentrations of 3,4-benzopyrene and anthracene, 20-methylcholanthrene, perylene, 1,12-benzoperylene, 3,4,9,10-dibenzopyrene, 1,2,3,4-dibenzopyrene, and pyrene were determined for the sites with heavy traffic. The average concentrations of the polycyclic aromatic hydrocarbons were 40 micrograms/100 cu m at the sites with heavy traffic, and 22 micrograms/100 cu m at the site with low traffic density.

35979 **APTIC NO. 58521**

Kitase, Masaru, Eiichi Ito, and Tetsuo Sakai

THE CONTENTS OF HEAVY METALS IN DUST FALLS FOR LAST TEN YEARS IN NAGOYA AREA. *(Nagoya-shi ni okeru kako 10 nenkan no koka baijin kaibunchu jukinzoku seibun ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):522, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 250.)*

The transition of metal content in settling particles in Nagoya over the last 10 years (1963-1972) was investigated. Samples were taken once a month by a deposit gauge, acid extraction was given to ashes in the settling particles, and spectrophotometry and atomic absorption spectrophotometry were used for quantitation of iron, copper, manganese, zinc, lead, nickel, and cadmium. Generally, the more ashes contained in settling particles, the more heavy metals found. The year 1968 was the lowest point for both ashes and heavy metals. Compared with the measurements of 1963, the 1972 measurement of Cu is slightly less, but the rest are on the same level or slightly increasing. Nickel has especially increased. In industrial areas, the ratios of Ni, Cd, Fe, and Pb were 1.6 times greater than those in residential areas; Mn was about 1.1 times greater.

35980 **APTIC NO. 58841**

Koyama, Tsuneto, Shigeru Miyazaki, Isamu Koizumi, and Yasuji Kanno

PARTICULATE SIZE DISTRIBUTION OF ATMOSPHERIC SUSPENDED DUST IN KANAGAWA PREFECTURE. *(Kanagawa-kenka ni okeru taikichu no fuyu funjin no ryukei bunpu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):319, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 65.)*

A cascade impactor was used for measuring the particle size distribution of suspended particulates in Kanagawa Prefecture; the relationship between the weather and the particulate size distribution and the measurement comparisons with the results of high volume samplers were made. The two locations where measurements were taken were very far apart and the degrees of pollution were extremely different. But the particle size distributions in two areas were almost the same, following the logarithm regular. The average mean diameter was 1.2 micron, and approximately 85% were less than 10 micron m and 67% were less than 3.3 micron m. Seasonally, the suspended particulate concentration was high in winter, and the mean diameter was smaller. The number of less than 1-2 micron m particles increased in winter. Up to a wind velocity of 3 m/sec, with the increase of the velocity, the mean diameter of particles grew smaller, and with the increase of vapor pressure, the particle diameter increased. The measurements by a high volume sampler and a cascade impactor formed approximately a linear relationship.

35981 **APTIC NO. 58847**

Kumazawa, Yasumasa

AIR POLLUTION TODAY AND FUTURE IN BIG CITIES AND THEIR VICINITY. REPORT 3. HANSHIN DISTRCT. *(Daitoshi to sono shuhenchiiki ni okeru taiki osen no genjo to shorai (3). Hanshin chiku). Text in Japanese. Bosei Kanri (Rust Prev. Contr.), 17(3):11-20, March 1973.*

Air quality measurements were taken in Osaka Prefecture. Although the heavy oil consumption increased from 5.2 million kl in 1967 to 8.1 million kl in 1970, the total emissions of sulfur dioxide remained at the same level because of the decreased sulfur content of the oil. The SO2 concentrations measured at various places in 1967-1970 ranged from 0.018-0.091 ppm. The suspended particulate concentration decreased to 1/3 of its value from 1967 to 1970. The maximum concentration of carbon monoxide in 1 day was 5.7-31 ppm in Osaka city and 1.8-14.5 ppm in neighboring cities. All places save two met environmental standards. Nitric oxide concentrations were 0.023-0.058 ppm and 0.038-0.060 ppm for nitrogen dioxide. The maximum value for oxidants was 0.27 ppm. The annual mean concentration of hydrocarbons was 0.85-2.1 ppm and the maximum value was 8.0 ppm.

35982 **APTIC NO. 58573**

Matsui, Takayoshi, Motohide Murata, Noriyoshi Ito, Shima Hirohisa, Yukinobu Yamada, and Shuji Hayakawa

HEAVY METALS OF SUSPENDED PARTICULATES IN YOKKAICHI CITY. *(Fuyu junjin ni kansuru kenkyu (6), shu to shite jukinzoku osen ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):532, Oct, 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 259.)*

Monthyl 24-hour samples of suspended particulates were taken at 11 locations in Yokkaichi and a neighboring township by hi-vol air samplers, and analyses were made by colorimetry and atomic absorption spectrophotometry. For 1971 and 1972, the averages of total measurements were 152 and 151 micrograms/cu m, and yearly averages maximum were 184 and 189 micrograms/cu m respectively, and minimum were 113 and 104. Variation coefficients were smaller and a wide area total pollution tendency was noted. The ratios of sulfate mist for the 2 years were 9.7 and 9.2% and have not changed much from the previous years. There was no increase in the amount of iron and vanadium; the 1972 figures of nitrogen trioxide and lead showed a 30-50% increase, and nickel decreased about 30% in 1972. The total quantities of 1971 taken at 8 locations showed significant relationships among SO4(-), NO3, Fe, Mn, Pb, V, and Ni. The double correlations of Mn, V, and NO3(-) showed significant figures with less than 0.5% risk rate. Regression formulas were obtained.

35983 **APTIC NO. 59008**

Matsushita, Hidetsuru, Keiichi Arashidani, Kunihiko Asakuno, and Toshio Odaira

DETERMINATION OF BENZO(A)PYRENE IN TOKYO AIR. *(Tokyoto kukichu no benzo(a)piren no sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):553, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 278.)*

The dust samples obtained at 10 of Tokyo s regular monitoring stations between January and March 1973 were analyzed, and the amounts of benzo(a)pyrene and a few other polynuclear aromatic hydrocarbons were examined. The average benzo(a)pyrene content was generally high where the degree of air pollution was high. The maximum average in the very polluted Ota district was 51.2 micrograms/g and was approximately 57 times that of the Ogasawara Island average. The measurements taken at the Tokyo Tower were 3.0 micrograms/1000 cu m at 25 m; at 125, 21.1; and at 225, 1.4; they showed the tendency to decrease with the increase of altitude. But the benzo(a)pyrene content per unit of dust did not decrease so much with the altitude. With the size decrease of suspended particulates, the unit air benzo(a)pyrene content and unit weight content both increased. This means the greater part of benzo(a)pyrene exists in dusts of less than 3.7 micron, which infiltrate easily into the lungs. The content ratio of benzo(ghi)pyrene was about twice as much as that of benzo(a)pyrene.

35984 **APTIC NO. 58996**

Miyamura, Norifumi, Motohide Murata, Noriyoshi Ito, Michi Takatsuka, Takeshi Kanamaru, Tamaki Hashizume, Yumiko Kobayashi, and Senichiro Shirai

HEAVY METALS IN DUST FALLS IN YOKKAICHI CITY AREA. *(Yokkaichi chiiki ni okeru koka baijinchu no jukinzoku ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):523, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 251.)*

Heavy metal pollution in Yokkaichi was analyzed in settling particles. Vanadium, manganese, iron, and lead were found in samples taken at 20 locations between April 1972 and March 1973. Vanadium was analyzed by BPA chloroform colorimetry, and Fe, Mn, and Pb were measured by atomic absorption spectrophotometry. Pollution was concentrated in the southeastern chemical industry area, and V and Fe showed similar concentration patterns, with a dramatic decrease in the peripheral areas. The ratio of solubles in the total amount was 66.8% for Mn, 71.7% for V, 65.5% for Pb, and the specific weight of soluble salt in the air was high, but the ratio for Fe was 20.4% and was low. For other metals in the industrial area, the ratios of nonsolubles ranged between 35 and 50%. The ratios of metals in the total settling particles were: Mn, 0.03%, V, 0.03%, Pb, 0.04%, and Fe, 1.91%, which were similar to those in other cities. The correlation matrix for settling particles, sulfate ions and sulfur dioxide with each metal are presented. In most items, significant relations were noted with 1% risk rate.

35985 **APTIC NO. 58587**

Mizoguchi, Isao, Yasuhito Sato, Kuniyoshi Makino, Masanobu Osawa, and Hiroshi Yagyu

COMPARATIVE STUDY ON THE DIFFERENCES OF OXIDANTS CONCENTRATIONS DEPEND ON TWO SITES IN A SCHOOLYARD AND BUILDINGS. *(Bisho ichisa ni yoru okishidanto nodosa no hikaku kenkyu). Text in Japanese. Tokyo Toritsu Eisei Kenkyusho Kenkyu Nenpo (Annu. Rept. Tokyo Metrop. Res. Lab. Public Health), no. 24:325-329, Dec. 1973. 10 refs.*

Various factors contributing to the differences in oxidants concentrations were investigated in school environments by two massed ozone meters. Conditions examined were the differences caused by locations in classrooms, locations in the schoolyards, indoors, outdoors, windows closed and open, curtains closed and open, the type of curtains, and different levels of the building. The findings were as follows: when the window is closed, the concentration of oxidants in the room is considerably lower than that of the outside; curtains do not contribute so much to decomposition of oxidant as does to stopping or interruption of air current; the concentration differences by height and location may be caused by localized wind, the solar radiation direction, buildings nearby, and trees. Localized differences in oxidant concentration are easy to form and sometimes these differences are considerable.

35986 **APTIC NO. 59124**

Nakai, K., S. Iizaka, M. Kimura, T. Mita, and M. Mihashi

ON THE PHOTOCHEMICAL SMOG AT TAISHIDO MIDDLE SCHOOL (II) -- SOME EVIDENCE ON POLLUTANTS. *(Taishido chugaku ni okeru kokagaku sumoggu ni tsuite (dai 2-ho) -- Osenshitsu ni kansuru ikutsuka no chiken). Text in Japanese. Tokyo-to Eisei kyoku Gakkai shi (Rept. Tokyo Public Health Studies), no. 52:48-49, Oct. 1973. 5 refs.*

The concentrations of carbon dioxide, nitrogen dioxide, nitric oxide, and oxidants were measured hourly at the Taishido Middle School. Ninety-four schoolchildren showed symptoms of poisoning by smog between April and July in 1973. The amount of CO exhausted from highway traffic is not significant. Maximum oxidant concentrations occur at noon, but there is no relation between oxidant, NO, and NO2 concentrations.

35987 **APTIC NO. 58499**

Nakano, Yukio and Keigo Nakamura

INSTRUMENTAL ANALYSIS OF CO, NOX AND THC IN JET ENGINE EXHAUSTS (JT3D, 9D). *(Jetto enjin (JT3D, 9D) no haigasu-chu no CO, NOx, THC no renzoku bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):455, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 189.)*

A continuous analysis was given to exhaust gases of aircraft jet engines (JT3D and 9D), and carbon monoxide, nitrogen oxides, total hydrocarbons and carbon dioxide were measured. The CO and CO2 were analyzed by non-dispersive infrared analyzer; NOx were measured by chemiluminescence detector; and THC were measured by flame ionization detector. With the preliminary test, the THC concentration during idling was extremely high and the leader tube was polluted and error was caused in the reading of other modes. Therefore, backflash was given to the sampler after taking idling measurements for JT3D and for JT9D, the leader tube was closed near the analyzer. Also for JT9D, for the climbing mode, at the end of measuring, 200 gal/min of water was jet sprayed for 2 min in the combustion room. By this spray, CO increased from 7.7 ppm to 225 ppm, NOx decreased from 323 ppm to 17 ppm, THC increased from 1.2 to 15 ppm, and CO2 was 4.5% instead of 4.3%.

35988 **APTIC NO. 58497**

Nakazawa, Yuhei and Tomio Sato

ON HEAVY METALS IN SUSPENDED PARTICULATES IN NAGANO PREFECTURE. *(Nagano-ken ni okeru fuyu funjinchu no jukinzoku ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):609, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 330.)*

The measurements of heavy metals in suspended particulates were taken at 11 locations in Nagano Prefecture. Samples were taken for 24 hours by hi-vol samplers three times a month. The sample materials were analyzed by wet methods, and the measurements of lead, cadmium, zinc, iron, copper, nickel, manganese, and cobalt were taken by atomic absorption spectrophotometry. The measurements of heavy metals were in general 1/5 to 1/10 of those in Tokyo and Kawasaki. The measurements in the city of Ueda and around Lake Suwa were higher than those in highland resorts by two-three times for Pb and Cd, five-six times for Zn and Mn, and 10 times for Fe. The measurements in highland resorts were about 0.08 micrograms/cu m of Pb, 0.001 of Cd, 0.13 of zn, 0.41 of Fe, 0.02, of Mn, 0.04 of Cu, 0.01 of Ni, and 0.002 of Co.

35989 **APTIC NO. 58424**

Oikawa, Kikuo, Katsunori Honma, and Tetsuo Mamuro

CHEMICAL COMPOSITION OF PARTICULATE MATTERS ABOUT JET ENGINE. *(Jetto enjin (JT3D,9D) haigasuchu no ryushijo busshitsu no kagaku sosei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):460, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 194.)*

The composition and structure of metals and polynuclear aromatic hydrocarbons in jet engine exhaust gas were examined. A high-vol sampler with glass fiber filter paper was installed in the test cell exhaust booth and all the particulates emitted by one cycle test were sampled. Particulates emitted by each mode were also collected by membrane filter installed in a low volume sampler. The airport environmental atmosphere was also sampled for comparison. For metals, atomic absorption analysis, for polynuclear aromatic hydrocarbons, thin layer chromatography and fluorescence spectrometry were used. Engine exhaust gas did not contain any more metals than the atmospheric metal content. The exhaust gas dusts contained 5.4 to 30.4 micrograms of benzo(a)pyrene per g of dust, 8.9 to 9.19 micrograms/g of pyrene, and 14.07 to 49.9 micrograms/g of fluoranthene; these figures were extremely high compared to the polynuclear hydrocarbon content in the air.

35990 **APTIC NO. 58448**

Omichi, Sadao and Hiromi Uno

METAL CONTENTS IN THE AIR OF KEIYO INDUSTRIAL AREA. *(Keiyo kogyo chitai ni okeru taikichu no* *jukinzoku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):437, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 171.)*

Suspended particulates in the Tokyo-Chiba industrial belt were sampled by a high volumn air sampler; iron, manganese, nickel, and vanadium were analyzed by emission spectrophotometry; and lead, copper, chromium and cadmium were analyzed by atomic absorption spectrophotometry. Samples were taken between 1970 and 1972, four times a month, at 12 locations between Ichikawa and Futtsu. In each year, in all categories, concentrations were higher in December than in July. Geographical differences were compared in four areas: Ichikawa, Chiba, Ichihara, and Kimitsu; except for Ni and Cr, all metal measurements and total dusts were highest in Chiba. There were no other definite patterns. The results are presented in tables.

35991 **APTIC NO. 58359**

Oya, Fumihiko, Shogo Ochiai, Takashi Mukaida, Nobuyuki Ishizaka, and Norio Yui

PHOTOCHEMICAL AIR POLLUTION IN KANAGAWA (NO. 6), VARIATION OF OXIDANTS CONCENTRATION IN PHOTOCHEMICAL AIR POLLUTION. *(Kanagawa- ken ni okeru kokagaku kogai ni tsuite (dai-6-ho) kokagaku kogai hasseiji no osen busshitsu sogo no hendo to ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):581, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 304.)*

The oxidant concentration time changes in Kanagawa show a pattern of a gradual elevation about 8 am, a peak about noon to 3 pm, descent about the time of sunset, and then reaching the lowest point between 3 and 6 am. The difference from the pattern of sulfur oxides consists of drastic fluctuations regardless of the meteorological stability. The fluctuations of oxidant and nitric oxide time changes measured at four locations in Kanagawa prefecture are presented in graphs. They all show different patterns. Where there is a heavy traffic, oxidant peaks appear in the morning and evening, showing the effect of nitric oxide.

35992 **APTIC NO. 58823**

Oya, Fumihiko, Shogo Ochiai, Takashi Mukaida, Nobuaki Kadoya, and Hiroshi Yanaka

PHOTOCHEMICAL AIR POLLUTION IN KANAGAWA (NO.8): RESEARCH OF AIR POLLUTION BY CORRELATION-SPECTROMETER IN KANAGAWA. *(Kanagawa-ken ni okeru kokagaku kogai ni tsuite (Daihachiho), Taiki osen ido ranzoku bunpu chosa ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):583, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 306.)*

The concentration of nitrogen dioxide and suspended particulates in Kanagawa Prefecture was studied by correlation spectrometry, nephelometry, a thermometer, Doppler radar, a radar altitude meter, and a crystal clock on an airplane. The period of investigation was 5 days in August 1972, and results were compared with those from an earlier investigation conducted in winter. The coastal high NO2 concentration pattern was the same as the records of winter, but high measurements were found in the inland districts of Kohoku and Machida, unlike the winter pattern. In winter, a high NO2 concentration existed only in the lower altitude below 500 m; in summer, some high concentrations extended to higher areas than 1000 m. Heavily traveled roads have a high concentration of NO2. High concentrations of suspended particulates in aerosol forms (200-360 micrograms/cu m) were found inland. The aerosol distribution was found above 1000 m. There were five spots on highways with high concentrations of over 250 micrograms/cu m; three of these locations also had high NO2 concentration.

35993 **APTIC NO. 58981**

Rondia, D. and J. de Graeve

AIR POLLUTION IN A DOWNTOWN STREET. *(Pollution de l air d une rue de centre urbain). Text in French. Tribune CEBEDEAUX Centre Belge Etude Doc. Eaux, 26(360):438-446, Nov. 1973. 7 refs.*

The outdoor and indoor carbon monoxide concentrations in a 7 m-broad downtown street and in adjacent commercial spaces in Liege were measured. The outdoor CO concentrations showed two peaks; one during the morning hours, and another, less pronounced one, during the late afternoon hours. With no indoor source of CO assumed, the indoor CO concentrations ranged from 7.4 to 35.4 ppm, while the outdoor CO concentrations in the street were in a range of 7.5-33.7 ppm. In commercial spaces in which smokers were present, the CO concentrations exceeded the outdoor concentrations by up to 8 times. Consequently, indoor sources of CO, such as smoking, have much more influence on the indoor CO concentration than traffic-generated outdoor CO does.

35994 **APTIC NO. 58429**

Sakata, Mamoru, Naomi Ito, Yoshito Funawatari, Shigeo Yasui, and Keigo Nakamura

MEASUREMENT OF ALDEHYDES IN JET ENGINE EXHAUSTS. *(Jetto enjin (JT-3D, 9D) no haigasu-chu no arudehido no bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):456, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973. Paper 190.)*

The aldehyde concentration in jet aircraft engine exhausts was measured and the composition was analyzed. The total aldehyde measurement was taken by the MBTH method and the composition analysis was done by the DNPH method. The gas chromatography column was OV 17 2%, carrier chromosorb W60/80 mesh (AW-DMCS), 1 m long, glass; temperature was 190-300 C, with 6 C per min rising. The results are presented in tables. The first figure is for JT-3D and the next is for JT-9D. The total aldehydes was 26 ppm and 13.6 ppm for idling mode; 6.8 and 1.6 ppm for take-off, 1.1 for both for climbing, and 0.8 and 0.3 ppm for approaching. The aldehydes composition measured by DNPH for the total of 23.1 ppm for the JT-3D engine was: 20.3 ppm of Cl, 1.4 ppm of C2, 0.6 ppm of C3, 0.3 ppm of C4, 0.2 ppm of C5 and benzene, 0.1 of toluene, and 0.03 ppm of C6. For the JT-9D engine, the total aldehydes were 2.2 ppm, 0.9 ppm of C1, 0.3 ppm of C2, 0.4 ppm of C3, 0.2 ppm of C4 and benzene, 0.1 ppm of C5 and toluene, and 0.01 ppm of C6.

35995 **APTIC NO. 59252**

Samuels, Harris J., SuzAnne Twiss, Evan W. Wong, Harmon Wong-Woo, Peter K. Mueller, John A. Maga, and George J. Taylor

VISIBILITY, LIGHT SCATTERING AND MASS CONCENTRATION OF PARTICULATE MATTER. *California State Air Resources Board, California Tri-City Aerosol Sampling Project and the California State Dept. of Public Health, Air and Industrial Hygiene Lab., 60p., July 1973. 13 refs.*

Mass concentration aerosol data was collected using two-stage and high volume samplers, light scattering data was collected with an integrating nephelometer, and prevailing visibility was observed at sites in Los Angeles, Oakland, and Sacramento from Jan. 1970 to March 1971. Visibility and light scattering correlated highly, and relations between these parameters agreed with theory. Visibility was an important index of air quality; because there were operational difficulties in acquiring prevailing visibility data, the integrating nephelometer was recommended as a useful instrument for routine air quality monitoring. Mass concentration correlated with light scattering and visibility. Expressions relating mass concentration to light scattering were not precise, however, and preclude the use of mass concentration data to describe visibility. In all three urban locations, the mass fraction of particulate matter in the refined range, i.e., particles nominally smaller than 3 micron in diameter, ranged from an average of 53% to 57% and for 24-hour samples was essentially independent of variations in total mass concentrations. (Author abstract modified)

35996 **APTIC NO. 58572**

Sato, Tamio and Yuhei Nakazawa

ON HEAVY METALS CONTAINED IN DUST FALLS IN NAGANO PREFECTURE. *(Nagano-ken ni okeru koka baijinchu no jukinzoku ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):524, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 252.)*

The metal content in settling particles in cities and resorts of Nagano prefecture were compared. Samples were taken by deposit gauge and solubles and insolubles were divided and wet analyses were made. Atomic absorption spectrophotometry was used for analysis of copper, nickel, lead, manganese, zinc, iron, and cadmium. Samples were taken between Jan. and April 1973. The total average of settling particles in the prefecture is 3.68 g/sq m/30 days. The amounts in cities are approximately 1.5 times that of resorts. The heavy metal contents in city dusts compared to those of resorts were: 1.5 times more for Pb and Fe, 1.5-2 for Zn, 2 for Mn, Cd, Cd, and 3 times more for Cu. There were no geographical differences for Pb and Fe. Metal ratios to the total settling particle were Pb, 0.03%, Cu, 0.02%, Cd, 0.006%, Zn, 0.15%, Ni, 0.016%, Mn, 0.18%, Fe, 2%, and Ca 2.8%. There were no significant differences between resorts and cities. The amount of settling particles at Lake Shirakaba was 2.41 g/sq m/30 days; the amounts of metals were 1/15 to 1/30 those in Tokyo.

35997 **APTIC NO. 58386**

Severs, R. K. and C. T. Chen

PARTICULATE MASS AS A PREDICTOR OF NUMBERS OF RESPIRABLE PARTICULATES. *Chemosphere, 2(5):199-200, 1973. 4 refs.*

The mass of suspended particulates in air was investigated as a predictor of the number of respirable particulates. Nephelometric measurements were made at several sites in Houston, Tex., on Aug. 23, 25, 28, 1972 and 24-hour high-volume air samples of suspended particulates were taken Aug. 19, 25, 31 at the same sites. A linear regressions model was assumed with the number of respirable particulates per volume of air the dependent variable, and suspended particulate mass per volume of air the regressor variable. The correlation efficient (c) between suspended particulate mass and the number of respirable particulates found at the various sites on Aug. 25 was 0.87 and the least squares estimate (s) was 1.79. For the 12-day average period, Aug. 19-31 at the same sites (r) was 0.90 and (s) was much smaller at 0.57. Suspended particulate mass is a good predictor of the number of respirable particulates over a fairly long period, however, daily variance is too large to allow prediction of the number of particulates at any one site on a daily basis.

35998 **APTIC NO. 58339**

Tsunoda, Fumio, Ikuko Aizawa, and Shiro Sakurai

CONCENTRATION OF FLUORIDE IN THE AIR OF VARIOUS COMMUNITIES IN JAPAN. *(Honpo kakuchi ni okeru taikichu fukkabutsu nodo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 8(3):496, Oct. 1973. (Presented at the Japan Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 226.)*

The gaseous fluoride, and water soluble and nonsoluble fluoride particle concentrations in the atmosphere were measured separately at 30 locations including Osaka, Kawasaki, Yokohama, aluminum refining industry areas, ceramic industry areas, ceramic industry areas, ironwork areas, regional industry areas, and commercial areas. Millipore filters and sodium carbonate soaked filters were used for sampling the atmosphere. Gaseous fluoride was extracted by warm water from the treated filter; particles were extracted by warm water; nonsoluble particles were measured by burning the filter after the solubles were extracted and distillating it by sulfuric acid steam. Fluorine ion electrodes were used for quantitation. The measurements in the neighborhoods of aluminum refining industries ranged from 0.03 to 4.02 micrograms F/cu m in total amount, with rather high ratios of soluble particles. In ceramic industrial areas, the total fluorides ranged from 0.05 to 2.16 micrograms/ F/cu m, and the ratio of gaseous fluoride was overwhelmingly high.

35999 **APTIC NO. 59290**

Uchiyama, Masahiro, Fumiko Hayashi, Yoshitaka Shimada, Isao Takahashi, Yuzuru Saito, and Yoshitsugu Shinozaki

AIR POLLUTION RESEARCH BY FILTER PAPER METHOD. *(Arukari roshi ni yoru taiki osen chosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):500, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 230.)*

The state of air pollution in Gunma prefecture was investigated by the alkaline filter paper method. Continuous measurements of sulfur oxides, nitrogen oxides, and chlorine ion were taken in industrial Shibukawa and the less polluted Maebashi for 1 yr. In Maebashi, alkaline filter paper screen boxes were installed at 13 elementary schools, and lead dioxide candles in shelters were used at 15 locations in Shibukawa. Sulfur trioxide in industrial areas of Shibukawa averaged at 0.25p mg/day 100 sq cm; in the industrial area of Maebashi, 0.079 mg/day/100 sq cm; in the suburbs of Shibukawa at 0.02 mg; and the outskirts of Maebashi, 0.055 mg. The nitrogen dioxide measurements in the industrial areas of Shibukawa was 0.022 mg, and in a similar area of Maebashi, 0.010 mg, Cl ion in the industrial areas of Shibukawa was 0.012 mg and in Maebashi, 0.006 mg. The seasonal variations of SO3 showed similar patterns in the two cities with lower measurements in summer and higher in winter. But there was a drastic increase in May, in Shibukawa. The seasonal fluctuations for NO2 were clearer and more similar, with more pronounced higher measurements from October to January. The Cl ion increased for both cities between Feb. and May.

36000 **APTIC NO. 58494**

Udagawa, Mitsuru, Saburo Fukuoka, and Toshio Odaira

STUDY OF AIR POLLUTION IN THE VICINITY OF TOKYO INTERNATIONAL AIRPORT. *(Tokyo kokusai kuko shuhen no taiki osen chosa kekka to sono kosatsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):502, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 232.)*

Automotic measuring apparatuses for sulfur dioxide, nitrogen oxides, carbon monoxide, and hydrocarbons were installed on two runways of the Tokyo International Airport and at a high school 400 m from the two runways. The measurements were taken for eight days, and the results were compared with those at two other locations in Tokyo. The SO2 measurements were 4.4, 5.2, and 4.0 pphm at the three locations at the airport, compared to 4.7 and 2.5 pphm in the city. Nitric oxide measurements were 6.6, 12.1, and 9.1 pphm compared to 4.8 and 6.2 pphm in the city; nitrogen dioxide concentrations were 5.2, 7.6, and 9 pphm compared to 2.8 and 2.5 pphm in the city; CO and HC measurements were negligible. No significant difference in these measurements was recognized. The metal contents in suspended particulates were examined with regard to iron, lead, manganese, copper, cadmium, and nickel. In all metals except for Cd, the measurements at one of runways were higher than others. Especially high measurements were 1.163 micrograms/cu m for Mn, 16.09 micrograms/cu m for Fe, and 1.97 micrograms/cu m for Pb. The combined effects with emissions from automobiles were suspected.

36001 APTIC NO. 58372

Wakamatsu, Shinji, Yoshio Saiki, Yasuji Himi, and Saburo Kanno

BACKGROUND CONCENTRATION OF AIR POLLUTANTS. *(Taiki osenbutsu nodo no bakku guraundo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):503, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 233.)*

The state of air pollution in Kanagawa prefecture was investigated by air quality measurements of the relatively unpolluted Hakone area, an industrial area, and along a highway with much traffic. Heavy metal contents in the air of three cities were also investigated. The measurement was taken for a month in May-June 1973, and the month s averages for nitrogen oxides were, in the order of Hakone, the industrial area, and the roadside, 8, 43, and 50 ppb; ozone concentrations were 33, 19, and 18 ppb; and oxidant concentrations were 50 ppb for the first two areas. The fluctuation coefficient of NOx in the industrial area was 1-2.2, and in Hakone, 0.3-0.6. The concentrations of lead, cadmium, manganese, nickel, iron, chromium, and total dust in the air were measured in Odawara, Fujisawa, and Yokohama. The measurements of Pb, Ni, Cd, and Cr in Yokohama were 5-10 times over those of Odawara, and Mn, and Fe, and dusts were 2-3 times over. In all categories, the measurements in Fujisawa were 1.2-2 times over those of Odawara.

36002 APTIC NO. 58417

Watanabe, Hiroshi, Nobutoshi Takada, Taihachiro Koyama, Hiroshi Kosaka, Masatoshi Nakamura, and Takatoshi Hiraki

INVESTIGATION ON PHOTOCHEMICAL OXIDANTS - ON THE ACID MIST IN URBAN ATMOSPHERE. *(Kokagaku okishidanto ni kansuru kenkyu -- taikichu ni okeru san misuto ni tsuite (dainiho)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):446, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 180.)*

Aerosol concentration and the time variation of various components were measured by a high volume sampler and a glass fiber filter paper. Samples were taken every hour from 9 am to 5 pm. The oxidant and aerosol concentrations showed significant correlations within a 1% danger rate; the increase of aerosol formation with the increase of oxidant was suggested. The time variation of aerosol concentrations agreed better with the fluctuation of sulfur dioxide levels. When a large amount of acidic mist was detected on thin metal films, there were no other temporary pollutants, and the formation of mist in the atmosphere was suspected. The ratio of aerosol sulfur tetroxide in 10% in winter (24-hour average) and 14-20% in summer. When acidic mist concentration is low, the ratio of SO4(--) is within the limits of the average; but when the mist concentration is more than 50/l, the SO4(--) ratio is higher than the acid mist average. The nitrogen trioxide ion shows no such relationship with acidic mist.

36003 APTIC NO. 58325

Yamane, Yasuhiro, Motoichi Miyazaki, and Yasunobu Osada

STUDIES ON METALS IN AIR POLLUTION. IV. STUDIES ON THE AIR- POLLUTIONAL NICKEL. *(Taiki osen ni kansuru kinzoku no kenkyu (daiyonho) taiki osen busshitsu to shite ni nikkeru ni kansuru kenkyu). Text in Japanese. Eisei Kagaku (J. Hyg. Chem.), 19(6):328-333, 1973. 16 refs.*

Seasonal and geographic variations of nickel concentrations in airborne particulates and deposits were surveyed in the Keiyo industrial zone of Chiba Prefecture. The deposits were collected using deposit gauges at eight sampling points in the zone from Feb. 1967 to Oct. 1968, and airborne particulates were collected by low-volume air samplers at two points from Oct. 1971 to Jan. 1973. Samples were ashed in an electric furnace at 500 deg for 1 hr, and nickel was determined by colorimetry with dimethylglyoxime after two extractions with 20 ml of hydrochloric acid and 1-2 ml of 30% hydrogen peroxide. The maximum amount of nickel (.00281 tons/sq km/mo) was found in the deposit obtained at sampling point III in Chiba City; and among the airborne particulates, the maximum amount of nickel (0.059 micrograms/cu m) was observed at sampling point V in Ichihara City. The results of seasonal and geographic variation of the nickel concentrations and the relationship between nickel and other metals in deposits and airborne particulates suggested that main emission sources were the ironworks in Chiba City and crude oil industries in Ichihara City.

36004 APTIC NO. 58520

Yamate, Noboru and Toshiro Matsumura

SUMMARY OF AIR POLLUTANTS LEVELS DURING THE PAST NINE YEARS (1964-1972) AT THREE AIR MONITORING STATIONS IN TOKYO. *(Saiki 9-nenkan (1964-1972) ni okeru Tokyo tonai 3 chiten no taiki osen sokutei kekka no gaiyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):501, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 231.)*

The data for air quality measurements at three locations in Tokyo over the period of 1964 to 1972 were surveyed. The concentrations of carbon monoxide, dusts, sulfur oxides, and formaldehydes decreased; the measurements of nitric oxide and hydrocarbons were constant; and nitrogen dioxide concentrations increased slightly. The total hourly average over nine years for CO was 4.6 ppm. The total hourly average for SOx was 0.056 ppm. The total hourly average for NO2 was 0.041 ppm. Nitric oxide total average was 0.087 ppm; dust total average was 272 micrograms/cu m; HCHO total average was 0.008 ppm; and total HC was 1.07 ppm. The trends are presented in graphs.

36005 APTIC NO. 58346

Aircraft Emission Gas Study Group (Japan)

REPORT ON THE INVESTIGATIONS OF AIRPLANE EXHAUST GASES. *(Kokuki haishutsu gasu chosa hokoku). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 25:3-94, Oct. 1973.*

A group of specialists investigated the effects of pollutants emitted from jet aircrafts by analyzing and measuring jet engine exhausts from JT3D and JT9D jets at the Tokyo International Airport between Oct 16 and 23, 1972 Carbon monoxide, carbon dioxide, nitrogen oxides, total hydrocarbons, aldehydes, cyanides, and sulfur oxides were measured, and the compositions of hydrocarbons were determined. The concentrations of sulfur dioxide, CO, HC, and suspended particulates in the airport area showed no difference from those in other areas. The NOx concentration in the airport area was slightly higher than control areas. This was true not only at the runways, but at other points a little farther from the airport and artery highways, and sources other than automobiles were suspected. Suspended particulate compositions showed no special pattern except for extremely high concentrations of manganese. This was also from sources other than jet engines or automobile exhausts. In general, it was decided that aircraft emissions affected the air quality of the ground area relatively little. But the high NOx and Mn concentrations require further investigations. It became clear that the ratio of HC to CO was greater in the jet engine exhaust than in automobile exhaust gas; the aldehyde ratio was also greater. The HC composition patterns were different from HC patterns in automobile exhaust, and jet engine exhaust involves more elements with more aliphatic HC (C12-C13) after the toluene peak.

36006 **APTIC NO. 58642**

Stanley Associates Engineering Ltd., Edmonton (Alberta)

SURVEY AND ASSESSMENT OF ATMOSPHERIC ODOR IN THE EDMONTON AREA. *100p., Feb. 1973.*

During 1972, a public opinion survey of Edmonton residents was made, odors were measured daily by odor panels, two surveys were conducted among metropolitan Edmonton residents in which individuals selected at random made observations concerning the occurrence of odors at their residences, and a telephone answering service was established to receive and compile odor complaints. Automotive exhaust was the most common and widespread odor source. Exhaust odor strength was not intense, nor considered extremely offensive to most residents. Chemical, meat processing, and sewage odors ranked next in order of frequency. These odors were usually stronger and more offensive. The southeast section of Edmonton had the worst overall odor problem, northeast Edmonton was second. Both areas had frequent odor occurrences, and were particulately affected by chemical and meat processing odors. Sherwood Park had a slightly lower incidence of odor occurrence, most of it due to the nearby petroleum and chemical industry. West Edmonton and St. Albert were much less affected by odors, with most residents feeling they did not have a serious odor problem. The major odor sources identified by Edmonton residents (excluding motor vehicles) were the meat packing and rendering plants, the east-end chemical plants, refineries, and sewage treatment facilities. (Author summary modified)

36007 **APTIC NO. 58647**

Office of Air and Water Programs, Research Triangle Park, N. C., Monitoring and Data Analysis Div.

THE NATIONAL AIR MONITORING PROGRAM: AIR QUALITY AND EMISSIONS TRENDS: ANNUAL REPORT. (VOLUME I). *EPA-450/1-73-001-a, 185p., Aug. 1973. NTIS: PB-226490/AS*

Trends in air quality and emissions are evaluated on a national and regional level based on data from the National Air Sampling Networks. The air quality trends are presented for total suspended particulates for 1960 through 1971; carbon monoxide, nitrogen oxides, and oxidants for 1962 through 1971; and sulfur dioxide for 1964 through 1971. Included is a detailed evaluation of ambient air quality for three Air Quality Control Regions. Emissions trends are presented on a national basis only for thy period 1940 through 1970. Air quality data, emissions data, and summaries of monitoring activities are presented for each State and Air Quality Control Region. Specific program areas emphasized are data acquisition and analysis, and trend identification and interpretation. (Author abstract modified)

36008 **APTIC NO. 58691**

Office of Air and Water Programs, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

AIR QUALITY DATA FOR METALS 1968 AND 1969 FROM THE NATIONAL AIR SURVEILLANCE NETWORKS. *APTD-1467, 188p., June 1973. 2 refs.*

NTIS: PB 224823/AS

The urban and nonurban concentrations of 12 metallic components of suspended particulate matter are listed based on particulate pollutant data gathered during 1968 and 1969 by the cooperating stations of the National Air Surveillance Networks. The metallic particulates contain beryllium, cadmium, chronium, cobalt, copper, iron, lead, manganese, nickel, tin, titanium, and vanadium. The data are presented as cumulative frequency distributions, including the number of valid samples taken, the minimum value, the maximum value, the arithmetic mean, the geometric mean, and the standard deviation, or as a composite concentration value for each site for each of the four quarters of the calendar year. A yearly average is reported whenever valid data for all four quarters were obtained. (Author abstract modified)

36009 **APTIC NO. 58852**

Kyoto Municipal Hygienic Research Inst. (Japan)

KYOTO MUNICIPAL HYGIENIC RESEARCH INSTITUTE ANNUAL REPORT, NO. 39. *(Kyoto-shi Eisei Kenkyusho Nenpo, dai-39-go). Text in Japanese. 92p. July 1973.*

The history of the Kyoto Municipal Hygienic Research Institute, the staff, main activities during the year, statistical records of monthly investigations and consultations, commissioned tests and findings in various categories of pollution and abstracts of various individual research projects are presented. In the area of air pollution, settling particles are continuously measured at 11 locations by deposit gauge; suspended particulates are measured by eight digital dust counters, two filter paper samples, and four low volume samplers. The 1972 annual average of settling particulates ranged from 2.43 tons/sq km/mo to 6.01 tons, with the highest monthly average of 7.54 tons and the lowest of 1.34 tons; the total average was 4.15 tons. The low volume sampler measurements of suspended particulates ranged from 35.9 mg/cu m in March to 156.7 mg/cu m in December. Sulfur dioxide was measured by 10 automatic meters and 33 lead dioxide candles. The total measurements of industrial, sub-industrial, commercial, and residential-office-and-park areas are presented in a table. The sulfur trioxide level of the sub-industrial area is generally higher than the industrial area, with the total monthly average of 0.49 mg/SO3/day/100 sq cm PbO2. The sulfur content in heavy oil, total automotive emissions, oxidants in the air, heavy metals in the air (lead, cadmium, copper, nickel, manganese, chromium, and vanadium), and polychlorinated biphenyls in flue gas were investigated during 1972.

36010 **APTIC NO. 59175**

Public Interest Campaign, Inc., Bethesda, Md.

PUBLIC INTEREST CAMPAIGN COLLECTION AND ANALYSES OF LEAD LEVELS IN NEW YORK CITY GASOLINE, AIR, DIRT AND CHILDREN S BLOOD. *Clean Air (Bethesda), 2(9-12):3-10, 1973.*

New York City was selected as a site for an inquiry into the contribution of lead in gasoline to the incidence of lead poisonings in urban areas in order to evaluate the future effectiveness of the Environmental Protection Agency s proposed lead regulation. Graphical data on the number of lead poisonings in New York over the period 1970-1973 indicate a decrease of about 50% in incidence, closely paralleling the pattern of lead in gasoline burned in the city. Data also reveals that since January 1972 when New York City s gasoline lead regulation went into effect, ambient concentrations have been on the order of 50% lower than earlier years. Lead concentrations in sidewalk dirt and dust, however, as measured since October 1972, are dangerously high in the range of 1500-2500 ppm and demonstrate that EPA s proposed lead reduction schedule in 1978 will have insufficiently reduced the lead poisoning hazard in sidewalk dirt and dust to inner city children.

36011 **APTIC NO. 59270**

Municipal Pollution Control Bureau, Yokohama (Japan)

REPORT ON THE 1971 INVESTIGATION OF AIR POLLUTION IN YOKOHAMA. *(Yokohama-shi taiki osen chose hokoku). Text in Japanese. Rept. 12, 116p., Jan. 1973.*

The 1971 report of the Yokohama Municipal Pollution Control Bureau includes the concentrations of settling particles, sulfur oxides (measured by lead dioxide and electroconductivity methods), environmental standards, heavy pollution warnings and countermeasures, photochemical pollution, carbon monoxide, and heavy metals in suspended particulates. The 1971 measurements of settling particles were down to the level of the minimum average in 1964 and seemed to be decreasing even more. The level of nonsoluble settling particles have reduced since 1966 and is at a plateau. Up to 1968, sulfur oxides tended to increase; since then, the measurements have decreased every year, especially in industrial areas, as a result of stringent emission standards. Photochemical smog warnings were issued eight times during the year, and physical damages were reported in 27 separate incidents, involving 2337 victims, of which 1721 (73.6%) were junior high school pupils, and 498 (21.3%) were elementary schoolchildren. The most prevalent symptoms were pains in the eyes and throats, but breathing difficulty, nausea, headache, and numbness were also reported. The ratio of the environmental concentrations failing to pass the CO standards was 0.4 and 0.9% for 8-hour values and 10.9% and 16.2% for 24-hour values at a busy intersection.

1972

36012 **APTIC NO. 59488**

Duffaud, J., F. Merkez, L. Truffert, M. Favart, and P. Chovin

DETERMINATION OF LEAD IN ATMOSPHERIC DUST IN PARIS. FIRST RESULTS OF A SIX-MONTH STUDY. *(Dosage du plomb dans les poussieres atmospheriques a Paris. Premiers resultats d une etude de six mois). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 12p., (May 3-5.)*

Results of a six-month investigation of the lead content in the atmospheric dust collected in Paris at 6 different sites between July and December, 1971, are presented. The dust samples, taken by Millipore HAWP 04700 white filters, were incinerated, after which the Pb content in the ashes was determined by the colorimetric method with dithizone. The Pb contents in the dust samples were generally fairly low, exceeding 10 micrograms/cu m only exceptionally. The average Pb contents in dust samples collected in July, August, September, October, November, and December were in the respective ranges of 0.9-3.9; 0.5-2.8; 1.2- 4.3; 2.0-6.5; 1.5-5.1, and 1.3-4.4 micrograms/cu m. There appears to be a relationship between the atmospheric dust Pb content and the traffic density, as demonstrated by the very high Pb contents during the subway strike. Also, reduction in the atmospheric Pb contents with increasing altitude and increasing distance from major highways and busy streets was observed.

36013 **APTIC NO. 59171**

Laamanen, Arvo and Matti Jantunen

CARBON MONOXIDE AS AN AIR POLLUTANT IN HELSINKI. *Inst. of Occupational Health (Helsinki (Finland), Rept. 23), 9p., March 1972. 4 refs.*

An emission inventory of carbon monoxide emission in the Helsinki air basin revealed some 64,000 tons of the pollutant during the year 1969. Gasoline motor vehicles accounted for 94%; diesels for 1%; and other sources such as heating installations and incinerators for 5%. Carbon monoxide was found in the street air at concentrations from 0-35 ppm at horizontal ground level (height 1.0-1.5 m, time 1/2 hr). Concentrations much higher than these occassionally occurred during periods shorter than 1/2 hr (3 min peak concentration at maximums as high as 95 ppm). The sites were chosen to represent maximal local concentrations. The area CO concentrations varied from 0.0-1.5 ppm (time 3 hr); and the highest mean concentration for a single area was 0.6 ppm, while the lowest was 0.4 ppm. The five sampling sites in this area survey represented mixed areas with regard to CO-source types. (Author abstract modified)

36014 **APTIC NO. 58439**

Mamuro, Tetsuo, Yatsuka Matsuda, Akira Mizohata, and Tadao Matsunami

RELATIONSHIPS AMONG VARIOUS ELEMENTS IN THE ATMOSPHERE OVER OSAKA DISTRICT. *Annu. Rep. Cent. Osaka Prefect., vol. 13:1-15, 1972. 4 refs.*

To study the area dependency of the concentrations of various elements in the atmosphere over Osaka district, simultaneous measurements were made at thirty stations by neutron activation analysis and energy dispersive x-ray fluorescence analysis. From the average concentrations for four weeks, the concentration variation over the area was analyzed by calculating the coefficients of variation for 31 elements, mostly metals. In order to study the relationships among concentrations of various elements, linear correlation coefficients were computed between all possible pairs of elements, including dust concentrations. (Author abstract)

36015 **APTIC NO. 59035**

Poirel, J. and M. Nomine

STUDY OF AIR POLLUTION IN UNDERGROUND SPACES: ACID AEROSOLS, NITROGEN OXIDES AND SULFUR OXIDES. *(Etude de la pollution de l air dans des ouvrages souterrains: aerosols acides, oxydes d azote et de soufre). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 10p. (May 3-5.)*

The sulfur dioxide, nitric oxide, nitrogen dioxide, sulfuric acid, nitric acid, and nitrous acid aerosol concentrations were studied in the air of mines where internal combustion engines, including diesel engines, were operated. The SO2, NO2, and NO concentrations measured were usually far below the maximum allowable 8-hour concentrations set forth in U. S. hygienic standards. The nitric and nitrous acids concentrations were also negligible and practically zero, while the H2SO4 concentrations reached the maximum allowable concentration of 1 mg/cu m. No relation between the SO2 and H2SO4 concentrations was found, which indicates that H2SO4 is formed independently of the exhaust gas SO2 content. Formaldehyde was not detectable in the air even by very sensitive methods.

36016 **APTIC NO. 58804**

Serna, J. de la, B. Sanchez-Fernandez-Murias, and Y. F. Caballero

THE 3,4-BENZOPYRENE IN THE ATMOSPHERE OF MADRID. *(El 3,4.-benzopireno en la atmosfera de Madrid). Text in Spanish. Rev. San. Hig. Pub., 46(1):87-97, Jan. 1972. 26 refs.*

Air samples over Madrid, Spain were analyzed for the presence of 3,4-benzopyrene, a carcinogenic polycyclic aromatic hydrocarbon which has been associated with bronchial cancer incidence. Known volumes of air were passed through a filter paper, with the hydrocarbons being removed by an organic solvent. Separation of the hydrocarbons was achieved by paper chromatography, and determination of 3,4-benzopyrene was performed by spectrofluorometry. Concentrations for the period June 1969 to December 1970 ranged from 0-122 micrograms/1000 cu m.

1971

36017 **APTIC NO. 59194**

Duce, Robert A., William H. Zoller, and Alun G. Jones

ATMOSPHERIC PARTICLE AND GAS SAMPLING AT MCMURDO AND SOUTH POLE STATIONS. *Antarctic J. (U. S.), vol. 4:133-134, July-Aug. 1971. 3 refs.*

The halogen content of the antarctic atmosphere was studied at coastal and inland stations to investigate the variation of gaseous and particulate halogen concentrations with distance from the ocean, which is the source of halogens. Approximately 250 atmospheric particulate and 25 gas samples were collected during Nov. and Dec. 1970, and chlorine, bromine, iodine, and trace metals were measured. Particulate I and Br concentrations at Pole Station were about 50% of their value at McMurdo, while Cl concentrations were at least a factor of 20 lower at the Pole. This suggests that I and Br are found in smaller particles with a longer residence time than Cl for samples collected in Hawaii. All particulate halogen concentrations were lower than those in Hawaii. Gaseous I and Br levels were smilar at the Pole and McMurdo, indicating a long residence time for these gases in the relatively particle-free antarctic atmosphere. Concentrations of both elements were five to six times lower than in Hawaii. Particulate halogen concentrations at McMurdo varied considerably with wind speed and direction, and the station may produce particulate and perhaps gaseous halogen pollution products.

36018 **APTIC NO. 59054**

Evendijk, J. R.

AIR POLLUTION IN ROTTERDAM AND SURROUNDINGS. *Keuringsdienst van Waren, Rotterdam (Netherlands), Lab. Luchtverontreiniging, 16p., Dec. 1971.*

The Air Pollution Control Board is the main pollution control agency in Rotterdam. Legislation, climatology, and air pollution concentrations in the Rotterdam area are described. Various pollution measurements are given for sulfur dioxide, nitrogen dioxide, smoke, carbon monoxide, benzo(3,4)pyrene, oxidants, and odors.

1969

36019 **APTIC NO. 59240**

Hoffman, Alan J.

DALLAS-FORT WORTH METROPOLITAN AIR POLLUTANT EMISSION INVENTORY. *National Air Pollution Control Administration, Durham, N. C., Air Quality and Emission Data Div., Office of Air Programs Rept. APTD-0695, 43p., April 1969. 7 refs.*

The emission inventory of the Dallas-Fort Worth metropolitan area is presented. Total emissions of sulfur oxides, particulates, carbon monoxide, hydrocarbons, and nitrogen oxides were estimated with respect to source type, season, and geographical distribution. The major pollution sources included transportation (motor vehicles aircraft, and railroads), industries, (lead plants, refineries, sulfuric acid plants, asphalt and concrete batching iron and steel foundries, cement industries, sand and gravel industries, and grain processing) steam-electric power plants, domestic heating, solid waste disposal, open burning, dumps, and incineration. Point source emissions collectively accounted for 65% of the SOx, 77% of the particulates, 7% of the CO, 5% of the HC, and 24% of the NOx.

1965

36020 **APTIC NO. 59476**

Siksna, Reinhards and Joseph Eichmeier

CONTINUOUS RECORDING OF SMALL AIR IONS IN CLOSED ROOMS. *Arkiv Geofys., 4(29):563-576, 1965. 9 refs.*

Continuous recordings were made of the concentration of small air ions in different closed rooms at the Institute of High Tension Research in Uppsala, Sweden. Radon and its decay products which are naturally produced in the ground and which are capable of escaping into other parts of a building from the basement appeared to the primary source for the high densities recorded in most rooms at the Institute. Generally, the ionic conditions were of different character in different rooms. Time variations on a large scale were also recorded in most of the rooms, and the ion density variations were likewise different for different rooms.

ATMOSPHERIC INTERACTION

1974

36021 **APTIC NO. 59333**

Ackerman, Bernice

WIND FIELDS OVER THE ST. LOUIS METROPOLITAN AREA. *J. Air Pollution Control Assoc., 24(3):232-236, March 1974. 6 refs.*

The wind fields over the St. Louis metropolitan area on two fair summer afternoons are described. Significant variations in both space and time domains were found in the lowest 2 km. At least some of the perturbations appear to be urban-related. The mean airflow was wavelike in the lower 500 m. Wind speeds varied by 20 to 30% and wind by 20 to 30 deg over the metropolitan area. This velocity field resulted in new convergence .00001 to .00005/sec downwind from the main industrial-commercial complex. Significant changes in wind velocity occurred on fairly short time scales. With suppressed convention, long-period oscillations propagated across the area at 2 to 3 times the speed of the mean wind. With stronger convection, the perturbations were larger and of shorter duration and an exchange of momentum across the subsidence inversion was occasionally indicated. (Author abstract)

36022 **APTIC NO. 58468**

Beamish, Richard J.

LOSS OF FISH POPULATIONS FROM UNEXPLOITED REMOTE LAKES IN ONTARIO, CANADA AS A CONSEQUENCE OF ATMOSPHERIC FALLOUT OF ACID. *Water Res., 8(1):89-95, 1974. 18 refs.*

In a previous study of 150 lakes, 70 had a pH of 5.5 of lower. In some lakes, acid levels increased more than 100-fold from 1961 to 1971. Therefore, the Ontario Society of Artist and Muriel lakes were studied to determine the effects of increased pH on fish populations. Fish disappeared as the lakes became acidic due to long-term lethal effects and an absence of recruitment of young into the population due to failure of reproduction. Emissions from the nickel smelters near Sudbury were the most probable source of contamination. This was shown by the anomalous concentrations of nickel in the lakes and precipitation; the high concentrations of Ni emitted into the atmosphere in Sudbury; the ability of sulfur dioxide to form acid in the atmosphere and fallout in precipitation over considerable distances from the emission source; the tremendous amounts of SO2 emitted by industry in Sudbury; and the abnormally high concentrations of hydrogen and sulfate ions in the lakes. (Author abstract modified)

36023 **APTIC NO. 58490**

Cleary, Robert W., Donald Dean Adrian, and Richard J. Kinch

ATMOSPHERIC DIFFUSION AND DEPOSITION OF PARTICULATE MATTER. *Proc. Am. Soc. Civil Engrs. J., Environ. Eng. Div., 100(EE1):187-200, Feb. 1974. 17 refs.*

Modeling of diffusion and deposition of particulates is discussed. Continuous point source emission of particulate matter is discussed. The deposition of particulate matter increases as the density of the particles increases. With heavy particulates such as fly ash, the amount of material settling on the earth is great enough to affect the overlying concentration field substantially. So much so that if the amount settling out is not accounted for by an earth boundary condition, then any pollution model employed will likely be in significant error. Therefore, this accounting should be done through a boundary condition before the model is solved and not as a correction appended to a solution which is based on a no-flux boundary condition or no boundary condition at all. The work of previous workers is extended by dealing with the three dimension version of the convective-diffusive transport equation subject to a very general third type earth boundary condition and a semi-infinite range for the vertical direction. The analysis is restricted to nearly neutral or stable conditions. An integral transform solution is used in the analysis. The analysis of diffusion and deposition under a first type boundary condition is also given. An illustration is given.

36024 **APTIC NO. 58331**

Hallidy, Leslie A. and Jay Martin Anderson

A MODEL FOR THE DISPERSAL OF SULFUR DIOXIDE OVER AN URBAN AREA. *Environ. Letters, 6(1):55-75, 1974. 30 refs.*

A model is presented for the generation of sulfur dioxide by stationary and moving urban sources, its dispersal into the atmosphere, its oxidation to sulfates including sulfuric acid, and the precipitation of sulfate particles and acid rain. The model is driven by parameters describing the size and meteorology of the urban area in broad, macroscopic strokes, but reflects the accepted physicochemical mechanisms for oxidation of SO2 to sulfates and the precipitation of sulfate particles and H2SO4 as well. The model was conceived and constructed using techniques of system dynamics and was programmed for computation using the DYNAMO language. The model was simulated for three different meteorological conditions to examine SO2 trends and to indicate the potential utility of the model in simulating SO2 over other cities to determine emission standards. The three conditions were standard conditions, an inversion, represented by lowering the maximum mixing depth, and a dry spell, simulated by stopping rainfall for one week. In these three conditions the SO2 and sulfate concentrations reached maximums of 0.00064 and 0.00028 mmol/cu m (before rainfall) and .00046 and 0.00018 mmol/cu m (after rainfall), 0.0017 and 0.0006 mmol/cu m, and 0.00064 and 0.00052 mmol/cu m, respectively.

36025 **APTIC NO. 58546**

McElroy, Michael B., Steven C. Wofsy, Joyce E. Penner, and John C. McConnell

ATMOSPHERIC OZONE: POSSIBLE IMPACT OF STRATOSPHERIC AVIATION. *J. Atmospheric Sci., 31(1):287-303, Jan. 1974. 55 refs.*

Models of stratospheric temperature and ozone were developed and gave good agreement with observed data. The atmosphere is in local radiative equilibrium at heights above about 35 km, and concentrations of ozone above 28 km can be satisfactorily estimated by models assuming photochemical equilibrium. Nitric oxide, formed by photochemical decomposition of nitrous oxide and ammonia, is an important catalyst for recombination of odd oxygen below 50 km, and is responsible for a reduction, by about a factor of two, in the computed column density of O3. Possible consequences of NO and water vapor, exhausted by stratospheric aircraft, are discussed. There should be a significant reduction in the concentration of the stratospheric O3, with a related decrease in stratospheric temperature, if the globally averaged aircraft source of NO exceeds 2 times 10 to the 7th power molecules/sq cm/sec, approximately half the natural source of the NO. An increase in stratospheric water vapor causes a small increase in the concentration of O3 but cannot compensate for the much larger effects associated with NO. The more detailed analysis confirms conclusions drawn earlier by Crutzen and Johnston regarding the possible impact of large numbers of supersonic transports. A fleet of 320 Concordes operating for 7 hr/day at 17 km would lead to a decrease of 1% in the column density of O3, and similar conclusions presumably apply to the Soviet TU144. Aircraft flying at higher altitudes, with similar exhaust characteristics, would be expected to induce relatively more serious changes in atmospheric O3. (Author abstract)

36026 **APTIC NO. 58648**

Peterson, James T.

CLIMATIC ASPECTS OF THERMAL POLLUTION. *Preprint, National Environmental Research Center, Research Triangle Park, N. C., Meteorology Lab., 24p., 1974 (?). 15 refs.*

The effects of waste heat on climate and the dispersion of atmospheric pollutants are discussed. The anthropogenic release of heat is largely responsible for the urban heat island, and, over mid-latitude cities, can exceed that received naturally from the sun. The excess warmth of cities, especially at night during anticyclonic weather situations, is a well-documented climatic feature that can exceed 10 C on occasion and averages 1-2 C annually for large cities. Heat emissions at the city surface cause a decrease in temperature with height which in turn aids the mixing and dispersion of pollutants. Many observations of urban and rural temperature height profiles have shown this effect of thermal emissions. Urban pollutants emitted near ground level, such as carbon monoxide from atuomobile exhaust, will be diffused through a greater volume of atmosphere with a consequent reduction in concentration. Pollutants emitted aloft, such as from the stacks of power plants, might more readily diffuse to ground level over an urban area, which is free of inversion, than over the nearby countryside. The altered thermal environment also affects the growing season and amount of precipitation. (Author summary modified)

36027 **APTIC NO. 59482**

Pueschel, Rudolf F., Charles C. Van Valin, and Farn P. Parungo

METEOROLOGICALLY SIGNIFCANT AIR POLLUTANTS. *Preprint, National Oceanic and Atmospheric Administration, Boulder, Colo., Atmospheric Physics and Chemistry Laboratory, 14p., 1974 (?). 11 refs.*

Cloud and ice nuclei measurements were performed in metropolitan Denver with a thermal diffusion cloud chamber and an acoustic ice nucleus counter, while membrane samples taken simultaneously were subjected to scanning electron microscopy and x-ray energy spectrometry in order to correlate the nucleation efficacy of the aerosol to its physical and chemical surface characteristics. The city aerosol was of a mixed nature, caused by an interaction of natural clay particles with anthropogenic aerosols and gases. The atmospheric number concentration of particles containing the elements lead, chlorine, and sulfur were associated with the intensity of human activities and therefore subject to temporal fluctuations. Leadbromochloride, a compound found in gasoline engine exhaust, and sulfur aerosols temporarily increased the surface solubitility and capillarity of naturally produced insoluble clay particles, a phenomenon capable of altering the atmospheric nuclei budget and affecting the removal mechanism of pollutants from the atmosphere.

36028 **APTIC NO. 59325**

Raynor, Gilbert S., Janet V. Hayes, and Eugene C. Ogden

MESOSCALE TRANSPORT AND DISPERSION OF AIRBORNE POLLENS. *J. Appl. Meteorol., 13(1):87-95, Feb. 1974. 15 refs.*

Pollen transport and dispersion from generalized area sources was studied by 29 flights to distances of 100 km and height of 3 km using an aircraft-mounted isokinetic sampler. Tree pollens and ragweed pollen served as tracers. Four types of flights were made to study various aspects of pollen transport: ascents over a fixed location to investigate vertical distribution; flights over a source-free area to document change of concentration with distance; east-west flights along Long Island to study the influx of pollen from the mainland with westerly winds; and vertical ascents and horizontal flights during sea breeze flows to determine their effect on pollen concentrations. Large quantities of pollen are transported in orderly fashion from their source regions but pollen often travels in large, discrete clouds. Pollen is transported to Long Island from the mainland in some quantity. Sea breeze flows greatly decrease low-level concentrations but pollen is carried aloft at the sea breeze front and recirculated in the return flow aloft. Vertical distribution is reasonably well related to lapse rate although secondary concentration peaks which often occur below elevated inversions cannot be explained by the data obtained. (Author abstract)

36029 **APTIC NO. 59118**

Rosinski, Jan

ROLE OF AEROSOL PARTICLES IN FORMATION OF PRECIPITATION. *Rev. Geophys. Space Physics, 12(1):129-134, Feb. 1974. 29 refs.*

The role of aerosols in the formation of the liquid phase of a cloud and in the formation of solid (ice) phase of clouds, and in particle transfer processes in clouds are reviewed. A fraction of particles in the 0.2 to 2 micron diameter size range acts as cloud condensation nuclei. Condensation of water vapor creates an aerosol cloud that consists of a population whose size distribution differs from that of the aerosol in the surrounding air and that consists largely of water. Very large particles create conditions for aerodynamic capture of different-sized cloud particles with subsequent growth of precipitation elements. These particles include sea salts, ice, and deka and hecto-micron soil particles in severe hailstorms. The ice phase is formed through three basic mechanisms -- contact nucleation, formation of a hydrosol particle, and upon further supercooling the hydrosol particle acts as a freezing nucleus and nucleates ice. Some of the aerosols exposed to supersaturation produced during freezing will nucleate ice through condensation followed by freezing. Ice-forming nuclei in snow crystals vary from 0.1 to 13 micron. The majority of the particles present in snow crystals are scavenged. Soil particles can play an important role as ice-forming nuclei. The majority of the particles present in cirrus clouds are of terrestrial origin, but particles of extraterrestrial origin have also been found. Thermophoresis and diffusiophoresis are both active in the transfer of 0.02 to 2 micron diameter aerosol particles into precipitation elements. Particles smaller than 0.02 micron are transferred by Brownian diffusion and those larger than 2 micron by impaction. Determination of a lifetime of an aerosol particle within a cloud (determination of the rate of aerosol particle transfer to a liquid or solid phase of a cloud), depends on the sizes of interacting particles and their physical state at the time of interaction. (Author abstract modified)

36030 **APTIC NO. 59308**

Sitaraman, V. and V. V. Shirvaikar

LAGRANGIAN SIMILARITY THEORY APPLIED TO DIFFUSION IN THE PLANETARY BOUNDARY LAYER. *Boundary-layer Meteorol., 5(4):419-427, Jan. 1974. 14 refs.*

A similarity theory is developed to describe diffusion of a cloud of passive material in a neutral barotropic steady state boundary layer of the earth s atmosphere. It is suggested that a characteristic length scale U asterisk/f is relevant in the diffusion process when the diffusing cloud mixes well into the depth of the boundary layer. For an atmosphere having an effective upper bound for vertical spread, an expression for the trajectory of the centroid of the diffusing cloud is derived. The theoretically computed vertical spread is compared with experimental data on diffusion of tracer cloud over rough (urban) and smooth terrains. (Author abstract)

36031 **APTIC NO. 59317**

Super, Arlin B.

SILVER IODIDE PLUME CHARACTERISTICS OVER THE BRIDGER MOUNTAIN RANGE, MONTANA. *J. Appl. Meteorol., 13(1):62-70, Feb. 1974. 26 refs.*

A modified NCAR acoustical ice nucleus counter was used in an airborne mode to measure the characteristics of silver iodide plumes released in mountainous terrain. These measurements were a supplement to a winter randomized cloud seeding experiment conducted in the Bridger Range, Mont. The AgI was generally transported upslope from the seeding sites, over the Main Ridge of the Bridger Range some 1400 ft higher, and toward the intended target area. Plume widths averaged 28 deg above the Main Ridge, while most of the seeding agent was confined to the lowest 1500 ft above the ridgeline. Ice nuclei concentrations were typically in the range of 100-1000/l, effective at -20 C. This corresponds to about 10-100 nuclei/l at the warmer temperatures prevalent in the lowest 1500 ft above the Main Ridge during winter storms. The flux of ice nuclei was estimated on three occasions. Agreement was good, both from day to day and with the generator output as calibrated in a large isothermal cloud chamber. (Author abstract)

36032 **APTIC NO. 59347**

Whelpdale, D. M. and R. W. Shaw

THE MODERATE- AND LONG-RANGE TRANSPORT OF AIR POLLUTANTS AND THEIR REMOVAL FROM THE ATMOSPHERE. *Experientia Suppl., no. 20: 31-41, 1974. 17 refs.*

Moderate and long range transport of air pollutants and the removal of these pollutants from the atmosphere are examined within the context of the cycling of contaminants through the ecosphere. Evidence exists for the transport of sulfur dioxide over Lake Ontario for distances up to 100 km, and studies of SO2 concentrations and vertical gradients of temperature with respect to regional wind direction show that the mean daily concentration of SO2 increases from 1.8 pphmy (when the regional wind is from the lake) to 3.0 pphmy (when it is from the land). The importance of vertical distribution of temperature for transport of pollutants over large distance is indicated. Measurements of SO2 gradients over Lake Ontario are currently being made to allow for an estimate of turbulent fluxes and thus pollutant exchanges at the interface. Once fluxes have been measured under a variety of atmospheric and surface conditions, then the exchanges of pollutants at the interface will be able to be parameterized on a regional basis, making possible reliable estimates of pollutant sink strengths.

1973

36033 **APTIC NO. 58915**

Amaya, Kazuo

ON THE CAUSE OF SO CALLED PHOTOCHEMICAL SMOG. *(Iwayuru kokagaku sumoggu no genin ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):571, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 294.)*

Recently, the possibility of hydrogen cyanide as a source of photochemical smog was reported, based on similar physical damage symptoms between those of poisoning by hydrogen cyanide and by photochemical smog. Related with this hypothesis, nitrates and nitrites are also possible photochemical smog sources. The combustion treatment of HCN produces a high concentration of nitrogen oxides, and these combine naturally with ammonia in the air and form ammonium nitrate and ammonium nitrite. These substances may condense with water particles in the air and cause an acute physical damage when the condensation reaches a certain level. Traceable amounts of nitrite salts have been detected in air samples; but nitrite salts tend to disappear very fast in the air, and the actual quantity in the air is suspected to be much higher. The wart-like damages that appeared on strawberry leaves on the campus of a Tokyo high school which had many photochemical smog victims could be recreated by solution of sodium nitrite. This suggests the presence of dangerous amount of nitrite in the atmosphere.

36034 **APTIC NO. 58311**

Badaev, Yu., S. Lyubovtseva, and L. S. Turovtseva

THE DETERMINATION OF THE AEROSOL MICROSTRUCTURE FROM MEASUREMENTS OF THE AUREOLE RANGE OF THE SCATTERING FUNCTION BY V. F. TURCHIN METHOD. *Text in Russian. Izv. Akad. Nauk SSSR Fiz Atmosfery i Okeana, 9(10:1044-1053, 1973. 15 refs.*

The aerosol particle size distribution was determined from measurements of the aureole range of the scattering function in fogs. The method of statistical regularization of the solution of inverse problems was applied in a statistical ensemble of smooth functions.

36035 **APTIC NO. 59225**

Bergstrom, R. W. Jr. and R. Viskanta

SPHERICAL HARMONICS APPROXIMATION FOR RADIATIVE TRANSFER IN POLLUTED ATMOSPHERES. *Preprint, American Inst. of Aeronautics and Astronautics, New York, 9p., 1973. 16 refs. (Presented at the American Institute of Aeronautics and Astronautics, Thermophysics Conference, 8th, Palm Springs, Calif., July 16-18, 1973, Paper 73-749.)*

A closed form analytical solution of the spherical harmonics approximation to the equation of radiative transfer is obtained for a nonhomogeneous, plane-parallel atmosphere up to the PN-approximation (a finite series of Legendre polynomials with N plus 1 terms). Gaseous and particulate constituents in the atmosphere are considered to emit, absorb, and anisotropically scatter radiant energy. The P1-P3 approximations of the of the spherical harmonics method are then compared to the 20th order Gaussian quadrature discrete ordinate and iterative methods of solution of the radiative transfer equation for an anisotropically scattering and absorbing medium. The computations performed for both homogeneous and nonhomogeneous atmospheres show that the lowest order spherical harmonics approximations predict the solar fluxes and flux divergences with good accuracy and result in a substantial saving of computational effort as compared to the discrete ordinate and iterative methods. The radiative transfer predictions can be combined into a large numerical model for global circulation, climatic, or thermal structure with the use of this approximation. (Author abstract modified)

36036 **APTIC NO. 59104**

Cassidy, A. B. and S. K. Mencher

THE WORLD S LARGEST CHIMNEYS AND THEIR EFFICIENCY AS AN AIR POLLUTION CONTROL DEVICE AS DETERMINED BY MATHEMATICAL MODELING. *VDI (Ver. Deut. Ingr.) Ber., no. 200:27-31, 1973.*

The world s tallest chimney is used as an illustration of the diffusion and dispersion of pollution by tall stacks. The degree of pollution reduction is a function of stack height, receptor distance from source, topography, and meteorological conditions. To calculate the effect of these conditions, a mathematical dispersion model can be used. In locations where periods of serious air stagnation can occur, because of the occurrence of temperature inversions, a tall chimney will often enable pollutants to penetrate the inversion layer which could cause emissions from shorter chimneys to accumulate. Penetration ability depends on inversion strength, the wind speed above the stack, the effective stack height, and the heat content of the plume. Calculations are given of the most effective chimney design for air pollution control which uses a tall chimney plus hotter than usual chimney exit gases. Graphs are shown for estimating the heat release required for penetration of elevated and ground level inversions. The construction technique and engineering and project management necessary to build the type of tall chimney described is reviewed.

36037 **APTIC NO. 58944**

Civitano, L. and A. Longhetto

A LIQUID-SUSPENSION, HIGH SENSITIVITY ANEMOGRAPH. *Atmos. Environ., 7(12):1285-1289, 1973. 1 ref.*

The construction and operation of a highly sensitive, liquid suspension anemograph are outlined with reference to its application to wind speed and wind direction measurements which are of great concern in problems such as pollutant diffusion. The vane shaft is linked to a float on glycerol, and the shaft pivots on a sprung jewel step bearing. The bearing keeps the whole system of the shaft and the float true; and the resulting friction is very low, provided that the thrust of the shaft on the jewel is less than 5 g. A system is provided for recording coherently over the full circle to ensure avoidance of the well-known difficulties which arise from the discontinuity over a sweep of 0-360 deg. The threshold of the wind-speed recorder is less than 0.1 m/sec, and the calibration curve does not depend on temperature since the flow regime of the glycerol is not laminar. The wind-direction recorder has a response time of 1 min; and the wind vane, set up at 160 degrees to the flow direction, is capable of moving when the air velocity attains 0.01 m/sec. The wind-direction and wind-speed recorders will be able to increase knowledge of light winds, which is of importance in pollution diffusion problems.

36038 **APTIC NO. 58907**

Djurfors, S. G.

RISE OF BUOYANT PLUMES IN CROSSFLOWS. *Ont. Hydro Res. Quart., no. 1:5-10, 1973. 8 refs.*

Consideration is given to the entrainment model of plume rise, and three simple plume-rise formulas for the prediction of plume trajectories under any atmospheric stability condition are derived. Available data on plume rise quite generally verify the expected theoretical relations, and an entrainment constant is derived which varies with the atmosphere s thermal properties in such a manner that it clearly decreases with increasing atmospheric stability. The largest errors were caused by neutral and unstable plumes.

36039 **APTIC NO. 58945**

Ensor, David S., Leslie E. Sparks, and Michael J. Pilat

LIGHT TRANSMITTANCE ACROSS SMOKE PLUMES DOWNWIND FROM POINT SOURCES OF AEROSOL EMISSIONS. *Atmos. Environ., 12(7):1267-1277, 1973. 15 refs.*

A new calculation procedure for theoretically predicting the magnitude of light transmittance across a smoke plume downwind of its emission source is presented which is based upon a combination of Mie light scattering theory and the Gaussian (Pasquill-Gifford) plume diffusion equations. Source information needed to estimate the light transmittance through the plume at a given downwind distance include the meteorological conditions, stack height, gas exhaust temperature and velocity, aerosol emission mass flow rate, size distribution, and refractive index. Graphs of the horizontal plume light transmittance dispersion parameter and the horizontal average extinction coefficient dispersion parameter are presented as a function of the downwind distance, and a sample calculation is included to illustrate the procedure and the use of various parameters. The new procedure should be useful in estimating the effect of source emissions on the plume opacity (and atmospheric visibility) downwind of the source. (Author abstract modified)

36040 **APTIC NO. 59074**

Fortak, F.

POSSIBLE APPLICATIONS OF EMISSION-CLIMATOLOGIC DISPERSION MODELS. *(Anwendungsmoeglichkeiten von immissionsklimatologischen Ausbreitungsmodellen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 200:173-188, 1973.*

For a given pattern of sources and a suitable index of meteorological dispersion parameters, the frequency distribution of concentrations in the total area surrounding the sources provides all relevant atmospheric climatological parameters. In particular, the frequency distribution identified according to wind direction is an especially useful source of atmospheric climatological information. Useful dispersion models for the simulation of atmospheric climatology are reviewed, and practical applications are discussed. These are: single chimneys, refineries, smelters, and cities, with and without transport from the surrounding area. An example is given of a solution to a planning problem from the viewpoint of optimizing within a framework of given standards.

36041 **APTIC NO. 58824**

Fujii, Toru and Kiyoshi Imamura

STUDIES ON THE AIR POLLUTION BY PHOTOCHEMICAL REACTION (2): PHOTOCHEMICAL SMOG FORMATION CONDITIONS IN SOUTH OSAKA (1). *(Kokagaku hanno ni yoru taiki osen ni kansuru kenkyu (2): Osaka nanbu chiiki no okeru kokagaku sumoggu no hassei joken (1)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):576, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 299.)*

As a basic study for photochemical reaction of air pollutants, ozone concentration fluctuations and meteorological conditions were investigated three dimensionally by airplans, kitoons, and balloons. High altitude ozone was measured; oxidant concentrations on the ground were measured by ground monitoring stations; and meteorological observations were made by kitoons, nonlift balloons, and pilot balloons. Ozone concentrations showed considerable fluctuation between 11 am and 1 pm in some parts of Osaka, especially in the southeast. At 8:30 am the highest concentration was noted at 700 m at about 15 pphm; at 10:30 am, the highest was at 100 m at 35 pphm; and at 1:30 pm, the highest measurement was noted at 300 m at 30 pphm.

36042 **APTIC NO. 58353**

Fukuoka, Yoshitaka and Isao Susa

LOCAL METEOROLOGICAL STUDY ON AIR POLLUTION OF BASIN CITY FUKUSHIMA. *(Bonchi toshi Fukushima no taiki osen ni kansuru kyokuchi kishogakuteki kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):396, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 135.)*

The relationship between meteorological factors and settling particles was studied in the Fukushima Basin area between May 1971 and February 1973. The correlation of settling particles and each meteorological factor, double correlations, and regression formulas were obtained by actual measurements of weather factors, model simulations, examinations of temperature inversions, wind direction distributions, and wind tunnel experiments. The results are presented in a table, a graph, and maps.

36043 **APTIC NO. 58366**

Go, Fujihiko, Yoshinori Ishikawa, Toshiki Oshio, Yasuo Yagi, and Akihiko Yoneda

APPROACHES TO THE DESIGN OF CALCULATING ANALYSIS ON AIR POLLUTION IN OSAKA. (PART 2). *(Osaka chiiki no taiki osen kaiseki ni tsuite, sono 2). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):513, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, Fukushima, Japan, Nov. 6-8, 1973, Paper 243.)*

In this investigation of mobile sources of automotive emissions in Osaka, the Osaka-Sakai area artery roads were considered as line sources, and busy sections of cities and their side roads were sectioned off into areas of 1 sq km and considered as area sources; and dispersion and pollutant concentrations were calculated. Average driving speed and driving pattern four-mode emission coefficients were calculated; and from the dispersion formula and dispersion parameters, unit pollutant emission quantities were obtained. Wind velocity and direction were taken into consideration, and finally the concentrations of carbon monoxide, nitrogen oxides, hydrocarbons, and particulates were calculated. This study clarified the ratio of nitrogen oxides from fixed sources and mobile sources. For local high concentrations, simulation studies with information on turbulence created by buildings and traffic conditions are necessary.

36044 **APTIC NO. 59090**

Gronskei, K. E.

A SIMULATION OF THE SHORT-TERM VARIATION IN THE SO2-CONCENTRATION IN OSLO DURING INVERSION. *VDI (Ver. Deut. Ingr.) Ber., no. 200:149-156, 1973. 8 refs.*

The systematic vertical motion and unhomogeneous horizontal motion in modeling air pollution near the ground were studied during simulation of the short-term variations in sulfur dioxide concentrations in Oslo during inversions. Experimental and theoretical results are compared. The wind model worked fairly well in 11 case studies during the winter and gave a reasonable wind estimate even during periods with weak wind conditions that often occur in Oslo. Although only about half of the short term variance in the measured SO2 concentration is explained, it may be concluded that the ventilation is taken into consideration in an approximately correct way. To show the relative importance of the different removal processes of SO2 from the ground level in Oslo, the different terms of the equation were integrated over the Oslo region, and the results are given in the percent of the SO2 emission: 40-80% removal by vertical transport; 0-50% removal by horizontal transport; and 5-20% removal by the applied sink term. (Author conclusions modified)

36045 **APTIC NO. 58367**

Ishikawa, Yoshinori, Yasuo Yagi, Toshiki Oshio, Fujihiko Kure, and Akihiko Yoneda

APPROACHES TO THE DESIGN OF CALCULATING ANALYSIS ON AIR POLLUTION IN OSAKA (PART 3). *(Osaka chiiki no taiki osen kaiseki ni tsuite (sono 3)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):514, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 3.)*

Multibox model simulations were made simulating highly polluted conditions in winter of 1970-1971 in the central Osaka area including Osaka and Sakai. Hourly emission quantities from fixed sources and dispersion conditions were calculated for a two-layer box model of 1 km square and 200 m high boxes. The records of wind velocity, wind direction, and temperature were used, and the upper layer wind condition and plume current were conjectured taking topography into consideration. The total of an area covering 6-10 km squares of Osaka Prefecture was divided into 28 blocks, and two-layer block models were built. The results of simulation were not altogether accurate, due to lack of data concerning the upper atmosphere; but for high concentration areas, with the time lag of 2 hours, the concentration and dispersion patterns of the model agreed with actual measurements very well. For more accuracy of the simulation model, more meteorological data and especially data concerning upper atmosphere are desirable.

36046 **APTIC NO. 59070**

James, K. W.

TALL STACKS AND IMMISSION CONTROL. *Tribune CEBEDEAU (Centre Belge Etude Doc. Eaux), Dec. 1973. 17 refs.*

Field surveys around power plants are presented which describe the dispersion of sulfur dioxide, dust, and other effluents around the plants due to tall stacks. Deficiencies of previous experimental investigations are discussed, and the monitoring methods used in these experiments are described. Ground level SO2 concentrations were measured with continuous meters. Meteorological data were measured with gustmeters, thermometers, anemometers, and lidar. Plume rise and dispersion were determined by a computer based on the field data. Maximum ground level SO2 concentration was mathematically determined and compared to field data. Plume rise was determined as a function of stack height and of different stability conditions.

36047 **APTIC NO. 58809**

Kasahara, Mikio, Kanji Takahashi, and Michiharu Takahashi

AEROSOL FORMATION FROM PHOTOCHEMICAL OXIDATION OF SULFUR DIOXIDE (2). *(SO2 no kokagakuteki sanka ni yoru earozoru seisei (2)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):554, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 279.)*

Aerosol particle size distribution and kinetic models of aerosol formation and particle growth process were studied by photochemical oxidation of sulfur dioxide. Sulfuric mist aerosol was formed by irradiation with ultraviolet rays. The test gas (SO2) is led into a cylindrical acryl reactor and is irradiated by blacklight under a given temperature and humidity condition. The aerosol particle distribution is constantly checked by a dispersion tube. The theoretical settling ratio was calculated using regular logarithm distribution. The effect of SO2 concentration, the effects of humidity and temperature on aerosol formation of sulfuric acid mist, the geometric mean radius of the aerosols, and a kinetic model of aerosol formation are presented in graphs.

36048 **APTIC NO. 58326**

Kitabayashi, Koji, Shigeo Shimogata, and Kiyoshi Sugawara

A STUDY OF TURBULENCE AND DIFFUSION CHARACTERISTICS OF NEUTRAL AND STABLY STRATIFIED BOUNDARY LAYER IN WIND TUNNEL. *(Antei seiso kyokaiso to kakusan no fudo jikken). Text in Japanese. Kogai (Pollution Control), 8(5):29-40, Sept. 1973. 8 refs.*

Turbulence properties and diffusion within neutral and thermally stratified boundary layers in a wind tunnel were studied. The wind tunnel floor was covered by a roughness element of wire-mesh with a mesh size of 3.5 mm. The floor was cooled up to 0 C for the stably stratified case, while the air temperature was about 28 C and the wind velocity was 2.5 m/sec. The longitudinal and vertical components of turbulence were measured by a hot wire anemometer system, and spectral characteristics were obtained digitally through analog-digital conversion and a digital computer. In the thermally neutral boundary layer, the flow properties such as velocity profile and spectral energy distribution of turbulence were similar to the atmosphere. In stably stratified flow, the velocity and turbulence properties did not become similar to the field; thus, the velocity profile changed as if the roughness scale was reduced by thermal stratification. The well known log plus the linear law for velocity profile was not satisfied. The energy spectra of vertical turbulence changed drastically, and did not show the existence of inertial subrange. Probably, it was due to the shortness of the upstream approach, i.e., the boundary layer was not developed well, and equilibrium was not attained. The diffusion properties became qualitatively similar to the atmosphere; the vertical plume width divided by turbulence velocity was only a function of floating time, regardless of the flow stability. This indicates the strong dependence of plume dispersion on turbulence velocity.

36049 **APTIC NO. 59075**

Kuelske, S.

TESTING AN AREA SOURCE MODEL THROUGH APPLICATION TO AN ISOLATED AREA SOURCE AND SIMULTANEOUS CONCENTRATION MEASUREMENTS. *(Ueberpruefung eines Vielquellenmodells durch Anwendung auf einen isolierten Flaechenemittenten und parallele Immissionsmessungen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 200:189-198, 1973. 6 refs.*

A multi-source model was used to analyze the fluoride concentration in the vicinity of an aluminum plant. The set of emitters consisted of two furnace halls, each 560 m long and 16 m high, and a chimney 130 m high. Concentrations were calculated for selected meteorological conditions and for a 5 by 5 sq km grid with a spacing of 200 m. The calculated results were compared with measured concentrations. Using mobile measuring devices, measurements were taken in the plume from the set of emitters. Up to 20 instrument mobile stations were used simultaneously. Comparisons between calculated and measured results were obtained at 30-minute intervals and for 86 sets of conditions. The results are explained and interpreted.

36050 **APTIC NO. 58685**

Kuriyan, Jacob G., Daniel H. Phillips, and R. Willson

DETERMINATION OF OPTICAL PARAMETERS OF ATMOSPHERIC PARTICULATES FROM GROUND BASED POLARIMETER MEASUREMENTS. *Preprint, California Univ., Los Angeles, Dept. of Meteorology, 40p., 1973. 18 refs.*

The theoretical analysis that is required to infer, from polarimeter measurements of skylight, the size distribution, refractive index, and abundance of particulates in the atmosphere is described. The radiative transfer equation in a turbid atmosphere and its formal solution were developed. The phase matrix that appears in the solution was then constructed. The sensitivity of the numerical solution that was obtained to the aerosol parameters was investigated mathematically. To illustrate the viability of the method, some data obtained at the University of California in Los Angeles was analyzed, and the atmospheric parameters were derived. The measured values of scattered intensity and degree of polarization were plotted. A reasonable value of reflectivity was chosen, and then the refractive index and the optical thickness were varied until the intensity and polarization curves obtained from theory matched the data points. The fits are displayed in figures. The albedo of the ground was calibrated by the first measurement, and further measurements studied the temporal variation of refractive index, optical thickness, and the modal radius of the size distribution.

36051 **APTIC NO. 58646**

Landsberg, Helmut E.

HUMAN INFLUENCE ON THE ATMOSPHERE. *(L influence de l homme sur l atmosphere). Text in French. Recherche, 4(31):125-134, 1973. 6 refs.*

Potential and actual human influence on the Earth s atmosphere at global and local levels is discussed. The amount of aerosols produced by human activity, though steadily increasing, remains to be quite negligible compared to spontaneous emissions. The predicted 20% increase in the atmospheric carbon dioxide concentration by the end of this century would cause theoretically a temperature increase by 0.5% which would, however, be offset by counteracting reactions, such the increased cloudiness. Anthropogenic dust emissions, accounting currently for some 10% of the natural dust emissions, would not lead to a global decrease in the atmospheric temperature in practice. Notwithstanding, settling dust can facilitate melting of ice and snow covers. The stratospheric nitrogen oxide and water vapor emissions by supersonic aircraft are too negligible to cause noticeable changes in the

Earth s atmosphere and climate. While the chances of anthropogenic changes in the Earth climate are very slim, the local climate is considerably modified by human activity, e.g., by urbanization and industrialization, which leads to the formation of heat islands over big cities due to increased heat absorption and sharply reduced evaporation. The attenuation of the wind force by the specific orography of cities may reduce ventilation and pollutant dispersion considerably.

36052 **APTIC NO. 59133**

Lohs, Karlheinz and Wolfgang Rolle

THE DISPERSION OF POLLUTANTS IN THE ATMOSPHERE AND SOME PREREQUISITES FOR POSSIBLE CHEMICAL REACTIONS TAKING PLACE DURING DISPERSION. *(Zur Ausbreitung von Schadstoffen in der Atmosphaere und zu einigen Voraussetzungen fuer dabei moegliche chemische Reaktionen). Text in German. Chem. Tech. (Berlin), 25(12):713- 718, 1973. 22 refs.*

The physical-chemical properties of the atmosphere are considerably influenced by the aerosols, although the absolute quantity of these aerosols is small compared to the total atmospheric gas volume. This seemingly small quantity of aerosols amounts to between 100 and 1000 kg/sq km of an air column of 1000 m excluding the anthropogenic components. A table of the size distribution of the most common gaseous and solid particles in the atmosphere is given. For example fly ash has particle diameters ranging from 80 to 3 micron, bacteria from 15 to 1.0 micron, and ammonium chloride mist from 2 to 0.1 micron. The particles stem from mechanical atomization and from combustion processes. The majority of these particles are of a metastable nature, their substance volatilizes at temperatures of 50 C or at intense solar radiation. Thermal and/or photochemically induced reactions are responsible for the degradation and conversion of these particles. The toxicity of individual components of the atmosphere is compounded by the synergistic effect. Of the host of problems and unsolved questions, two seem to interest most at present, the analysis of air pollutants including the toxic metabolites developing through interreaction and through dispersion and flow models.

36053 **APTIC NO. 59499**

MacCracken, M. C.

FIRST ANNUAL REPORT, DOT-CIAP PROGRAM. *California Univ., Livermore, Lawrence Radiation Lab., Atomic Energy Commission Contract W-7405-Eng-48, Rept. TID-4500, UC-53 Meteorology, UC-4 Chemistry, 233p., Feb. 13, 1973. 303 refs.*

NTIS: UCRL-51336

Summaries are presented for numerical models developed to determine the effects on global climate caused by large numbers of aircraft operating in the stratosphere; the numerical model studies were undertaken by the Lawrence Livermore Lab. as part of the Climatic Impact Assessment Program of the Dept. of Transportation. The models apply to dispersion and transport, global transport and kinetics, zonal atmosphere, stratospheric kinetics, and solar and ultraviolet radiation transport. Appendices are also provided for meteorological guidance, support of monographs, and a summary of meetings, visits, conferences, and papers submitted.

36054 **APTIC NO. 59160**

Maybank, J. and K. Yoshida

DROPLET DEPOSITION AND DRIFT FROM HERBICIDE SPRAYS - ANALYSIS OF THE 1973 GROUND-RIG TRIALS. *Saskatchewan Research Council, Physics Div., Rept. P. 73-16, 115p., Dec. 1973. 3 refs.*

A series of field trials were conducted over an area of 150 m long and 13 m wide, sprayed with 2,4D amine at two different spray boom pressures and two different solution concentrations in order to examine droplet deposition and drift from herbicide sprays. Initial drift from a ground-rig sprayer appeared to be about 3% of the material emitted when a 25 psi hydraulic pressure and nozzles capable of providing 5 gal/acre volume application were used and when the wind speed was 5-10 mph. The drift fraction was nearly doubled when the hydraulic pressure was 40 psi and was reduced by a factor of four when a volume application rate of 10 gal/acre was used. Drift amounts decreased with downwind distance at a rate that indicated 25-40% was still in the air 1000 m of travel, implying that significant amounts of spray may be blown off a field from positions well upwind of the field edge. Density fluctuations indicated that up to 20% of the sprayed area received, on occasion, less than half the expected rate of 8 oz/acre. (Author summary modified)

36055 **APTIC NO. 58623**

Mills, M. T. and M. Reeves

A MULTI-SOURCE ATMOSPHERIC TRANSPORT MODEL FOR DEPOSITION OF TRACE CONTAMINANTS. *Oak Ridge National Lab., Tenn., Atomic Energy Commission/National Science Foundation Interagency Agreement AG 389, 87p., Oct. 1973. 9 refs.*

NTIS: ORNL-NSF-EATC-2

An Atmospheric Transport Model (ATM) was developed from a Gaussian plume model to calculate the toxic material deposition rate at any point within a watershed, given the location of various air pollution sources. Sources included the point source (stack), area source (city), line source (road or railbed), and windblown source (dry tailings pond). These rates where then used by the Wisconsin Hydrological Transport Model (WHTM) to determine the subsequent transfer of the toxic materials to stream and ground water. The result was a Unified Transport Model (UTM) which couples the air, land, and water systems. Sample calculations and computer program input and output are given for a test area. (Author abstract modified)

36056 **APTIC NO. 59227**

Mills, M. T. and J. S. Olson

A MODEL FOR SUSPENSION AND ATMOSPHERIC TRANSPORT OF DUST. *Preprint, American Geophysical Union, 37p., 1973. 10 refs. (Presented at the American Geophysical Union, Fall Annual Meeting, San Francisco, Calif., Dec. 10-14, 1973.)*

A computer model was developed which treats the suspension and subsequent atmospheric transport of fine dust particles as a process initiated by the saltation of sand-sized grains. The saltation rate (g/m/sec) is calculated for a surface of known particle size distribution, assuming a wind speed versus time relationship from a typical Great Plains dust storm. The dust suspension rate (gm/sq m/sec) is approximately determined from hourly saltation values and used as an area source strength in the Sutton equation to give ground level air concentrations and deposition rates at different distances from the center of a dust covered area. The model also predicts the migration of the boundaries of this area due to the bulk movement of the sand-sized material. Most of the dust transport occurs during the relatively few hours of highest wind speed and is reduced considerably by the presence of even small amounts of vegetation. The results of this model can be applied to study future location and treatment of potentially toxic mill tailings. (Author abstract modified)

36057 **APTIC NO. 58306**

Murai, Keizo, Masaharu Kobayashi, and Ryozo Goto

SCATTERING FUNCTIONS OF THE ATMOSPHERIC AEROSOLS MEASURED BY THE POLAR NEPHELOMETER. *Kisho Kenkyusho Kenkyu Hokoku (Meteorol. Res. Inst. Rept.), 24(2):233-248, June 1973. 9 refs.*

A polar nephelometer with a xenon lamp (500 watts) was designed. Measurements were made of the scattering functions of atmospheric aerosol particles near the ground. These were obtained under varying meteorological conditions from Oct. 1970 to March 1971. The shapes of the scattering functions were classified into three groups and compared with the theoretical curves calculated for the size distributions of particles represented by the modified gamma function. The shape of the scattering function largely depends on the wind velocity. Hourly measurements were made on Dec. 4 to 5, 1970 and March 8 to 9, 1971 and the shape of the scattering function and the scattering coefficients were both dependent on the wind velocity at the time of the measurement. (Author abstract)

36058 **APTIC NO. 58403**

Naito, Keikichi

LIDAR OBSERVATIONS OF CONVECTIVE UPWARD TRANSPORT IN THE LOWER ATMOSPHERE. *(Taiki kaso ni okeru tairyo joho yuso na raida kansoku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):280, 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 32.)*

The pollutant transport condition in the lower atmosphere was observed through convective upward currents by lidar using suspended particulates as tracers. The upward movement took plumes of multiple paralleling banks. The rising speed was 5 m/sec, and the horizontal sizes of the plumes were about 500-1000 m in diameter near the ground surface. The wind direction was the same up to 1 km altitude. The paralleling plume bank formations were in the direction of the wind. The localized characters of these convective upward currents may be important factors in the formation of photochemical smogs.

36059 **APTIC NO. 58416**

Nakajima, Chotaro

CLIMATE AND AIR POLLUTION IN SETO INLAND SEA. *(Seto naikai no kisho to taiki osen). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):395, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 134.)*

The Inland Sea is relatively isolated from the outer ocean and is shallow. The surface water temperature is approximately 10 degrees lower than the temperature of the Pacific between winter and spring which influences the stability of the lower atmosphere over the Inland Sea. Along the coast, the sea-land breeze dominates and plays an important role in transport and diffusion of pollutants emitted by industrial belts all along the coast of the Inland Sea. The height of the land-sea breeze is up to 600 m, and the upper layers are dominated by opposite winds, contributing to the limitation of effective stack height. The meteorological and topographic characteristics and resultant pollution types are briefly discussed with regard to Otake, Kure, Hiroshima, and Mizushima.

36060 **APTIC NO. 58526**

Nakamura, K.

QUANTITATIVE FORECAST OF PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu no ryotei yoho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):570, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 293.)*

Pollution potential was indicated in terms of wind velocity (W) and mixed mean depth (MMD) to forecast photochemical smog in the Tokyo area. A good relationship was found between the total oxidant concentration and the reciprocal of W times MMD during the months of June, July, and August of 1972. It was considered as low pollution when 1/W times MMD was below 25 and as high pollution (oxidant concentration higher than 0.15 ppm) when it was over 50. The probability of high pollution occurrence was 40% when 1/W times MMD was between 25 and 50, and was more than 85% when it was over 50. Forecasting photochemical smog requires precise prediction of meteorological conditions.

36061 **APTIC NO. 58396**

Nakano, Michio, Taizo Nakano, Nobuhiro Sato, and Takashi Masuda

ATMOSPHERIC DIFFUSION COMPUTATIONS IN OSAKA CITY (REPORT 3). *(Taiki kakusan keisan ni yoru taiki osen kiyoritsu no suitei to sono oyo (III)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):445, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 179.)*

In the western coastal industrial area where the sulfur oxides concentration is relatively high, pollutant diffusion was calculated twice. In the past, the same calculation and the recommendations for reduction of sulfur oxide emissions resulted in the overall reduction of sulfur oxides and the 1972 annual average reached 0.047 ppm, 0.003 ppm lower than the former environmental standard. The area of calculation was expanded this time, and the entire city was divided into a mesh of 500 sq m, and the total of 800 cross points concentrations were calculated. The meteorological data were collected from 10 weather stations of the city. The emission sources are 1100 in the city and 450 in the adjacent cities. The diffusion calculation, lattice point concentration calculation, and effective stack calculation formulas are presented.

36062 **APTIC NO. 59283**

Nishida, Kaoru, Yutaka Itakura, Takeo Yamamoto, and Tomonori Ohashi

PREDICTION OF URBAN AIR POLLUTION LEVELS BASED ON WIND TUNNEL EXPERIMENTS. *(Fudo jikken ni motozuku baien hassei shisetsu kara no jugo osendo no suitei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):389, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 128.)*

Dispersion of pollutants from separate emission sources were tested using wind tunnels, and the complex pollution from a multiple number of sources were calculated. The Kobe area was taken as a model of three dimensional topography, a lattice of 500 m distance was formed on the model surface, and 556 sampling openings and 32 model stacks were provided. The experimental wind velocity was 3 m/sec, the tracer gas was ethane (C_2H_6, molecular quantity 30), and the emission speed was 60 cu cm/min. The tracer gas emitted from the stack was sampled from openings of the model, and the ground concentration distribution was measured by non dispersive infrared analyzer. Plots were taken based on the ground measurements, tracer concentration, wind velocity, effective stack heights, and emission quantity per unit time.

36063 **APTIC NO. 58825**

Okamoto, Masayoshi, Tetsuya Katayama, and Hiromi Yoshida

THE ANALYSIS OF THE QUANTITATIVE CHANGE OF PARTICULATE MATTER IN AIR BY LASER SCATTERING MEASUREMENT. *(Reza reda ni yoru mi sanran to chijo taiki chu no fuyu funjin nodo no henka). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):441, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 175.)*

Mie Scattering of laser radar (lidar) was used as a remote senser for air pollutant analysis. The scattering patterns were compared with the data obtained for suspended particulates and ozone concentrations by the continuous monitoring of the Toshiba Research Lab. The wind velocity and direction in the morning is west and 2 m/sec; this begins to change about 10 am to 6-8 m/sec and south. Suspended particulates begin to rise about 7 am and reach the maximum of 480 micrograms/cu m, and decrease to 150 micrograms/cu m about 11 am The Mie scattering intensity is almost proportionately related with the particulate concentration fluctuation. Ozone level decreases from 0.05 ppm to 0.004 ppm with the increase of particulates at about 10 am, and from then on, regardless of the level of suspended particulates, fluctuates between 0.04 and 0.02 ppm.

36064 **APTIC NO. 58531**

Oya, Fumihiko, Shogo Ochiai, Takashi Mukaida, Nobuaki Kadoya, and Hiroshi Yanaka

PHOTOCHEMICAL AIR POLLUTION IN KANAGAWA (NO. 7), VERTICAL DISTRIBUTION OF POLLUTANTS CONCENTRATION IN KANAGAWA. *(Kanagawa-ken ni okeru kokagaku kogai ni tsuite (dai-7ho), osen busshitsu no kodobetsu (rittai) nodo bunpu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):582, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 305.)*

The vertical concentration distribution of pollutants was investigated by kitoons and helicopers between June and August of 1972 at 38 locations in Kanagawa prefecture. On the ground, hourly automatic measurements were taken on oxidants, nitrogen oxides, hydrocarbons, carbon monoxide, sulfur oxides, dusts, wind direction and speed, temperature, and humidity. The kitoon investigations were given at the altitudes of 50 m and every 100 m between 100 and 500 m, on ozone, NOx, HC, CO and temperature; helicopter measurements were taken at every 100 m altitudes between 300 and 1000 m on ozone, NOx, SOx, and temperature. When sea breeze comes in and the front is stagnant, the upper atmosphere oxidant concentration rises over the wide area of prefecture, Tokyo Bay, and Sagami Bay. When there is a south wind of 203 m/sec in the inland in the morning, O3 is low over the Bays, but the ground oxidants and upper O3 levels rise. When O3 level in the upper altitude is high, NOx is low, but non-saturate HC show high figures. Previously, the upper sky of Sagami Bay was considered relatively unpolluted; but it was discovered that it is as heavily polluted as the upper sky of Tokyo Bay.

36065 **APTIC NO. 59140**

Padet, J. P., C. Lacroix, and R. Caille

STUDY ON A SPECIAL TYPE OF INDUSTRIAL STACKS. *(Etude d un type particulier de cheminees industrielles). Text in French. Rev. Gen. Thermique (Paris), 12(142):1013-1024, Oct. 1973.*

Theoretical aspects and advantages of a new type industrial stack, developed and installed at a glass-works are described. The stack is composed of a lower part of 42.60 m in height with a tapered top. The flue gases leaving the top of the lower part have free passage over 1.60 m before reaching the lower inlet of the upper part of the stack which has an increased diameter compared to the outlet of the lower part. The length of the upper section is 14.00 m, and its base diameter is 3.00 m. The new type stack has the advantages of guaranteeing low soil-level dust concentrations at reduced costs without interfering with the furnace operation. The flue gas jet experiences intensified rise due to reduced flow rate and increased stack diameter despite reduced thermal lift. Dispersion of pollutants also depends on the stack gas temperature.

36066 **APTIC NO. 58644**

Reiter, Elmar R.

THE DISPERSION OF RADIOACTIVE MATERIAL ON SMALL, MESO-, AND GLOBAL SCALES. *Colorado State Univ., Fort Collins, Dept. of Atmospheric Science, Atomic Energy Commission Contract AT(11-1)-1340, COO-1340-37, 48p., 1973. 27 refs. (Presented at the IAEA/WMO Symposium on the Physical Behavior of Radioactive Contaminants in the Atmosphere, Vienna, Austria, Nov. 12-16, 1973.)*

The scales of atmospheric motions and their effect on turbulent diffusion are reviewed. Mesoscale transport processes in the planetary boundary layer and the exchange between this layer and the rest of the atmosphere are described. Global transport processes, the exchange of air between the stratosphere and troposphere, and stratospheric residence times of nuclear debris are summarized. Pollution sources and sinks, deposition, fallout, washout and rainout, chemical and photochemical reactions of the pollutant within the air column under consideration, and losses through the top of the Ekman layer are mechanisms involved with the mesoscale processes. Global transport processes which are described include mean meridional circulation, standing eddies, traveling eddies, and mean residence times. (Author abstract modified)

36067 **APTIC NO. 58999**

Reiter, Elmar R.

OZONE, AEROSOLS, AND SOLAR RADIATION IN THE STRATOSPHERE. *J. Aircraft, 10(12):710-716, Dec. 1973. 13 refs. (Presented at the AIAA/AMS International Conference on the Environmental Impact of Aerospace Operations in the High Atmosphere, Denver, Colo., June 11-13, 1973, Paper 73-509.)*

A short review presented which points out highlights of the present knowledge of the stratosphere, especially with respect to ozone, nitrogen oxide, and water vapor problems, and explores some of the deficiencies in this knowledge which will have to be overcome before a complete assessment of the impact of supersonic traffic on this atmospheric region can be made. There is some indication that a slow increase of total ozone occurred in the 1960 s, although it is not yet clear whether volcanic eruptions, nuclear blasts, or solar activity are the primary causes. A secular increase of H2O vapor in the stratosphere was also noted for this period. Ozone soundings by balloons reveal great variations of ozone concentrations over shallow layers often less than 1 km thick. Irregularities in vertical shear and stability conditions have also been noted. Nitrogen oxides injected into the stratosphere and expected to react with ozone will, therefore, have to be considered together with a variety of possible ozone concentrations and with a variety of diffusion coefficients by which NOx is diluted. Atmosphere motions appear to be in direct competition with NOx in explaining the ozone distribution in the stratosphere. Ozone, which is generated photochemically in the stratosphere, is not only affected by, but also has a profound effect upon, the radiation fluxes that permeate the atmosphere; and the presence of aerosols, for instance, may change the radiation fluxes in the ozone layer significantly. Transport of ozone between the stratosphere and troposphere is mentioned.

36068 **APTIC NO. 59244**

Roberts, P. J., Mei-Kao Lui, S. D. Reynolds, and P. M. Roth

URBAN AIR SHED PHOTOCHEMICAL SIMULATION MODEL STUDY. VOLUME I - DEVELOPMENT AND EVALUATION. APPENDIX A - CONTAMINANT EMISSIONS MODEL AND INVENTORY FOR LOS ANGELES. *Systems Applications, Inc., Beverly Hills, Calif., Environmental Protection Agency Contract 68-02-0339, Program Element No. 1A1009, EPA-R4-73-030b, 57p., July 1973. 12 refs.*

Documentation is presented for all modifications and extensions which were implemented to improve the accuracy or resolution of a pollutant emissions inventory for the Los Angeles Basin for use in the photochemical modeling of the transport, diffusion, and reaction of atmospheric contamination. Pollutant sources were grouped into five categories, viz., automobiles (and other motor vehicles), aircraft, power plants, refineries, and distributed fixed sources. Emissions rates for a 2 by 2-mile grid system covering the Basin were compiled for nitrogen oxides, carbon monoxide, and hydrocarbons. Changes applicable to all portions of the inventory have been included in an introductory general section.

36069 **APTIC NO. 58314**

Sakuraba, Shinichi, Minoru Moriguchi, and Isao Yamazi

THE SPLITTING OF PLUME CENTERLINE HEIGHT IN ELEVATED-SOURCE DIFFUSION. *Kisho Kenkyusho Kenkyu Hokoku (Meteorol. Res. Inst. Rept.), 24(1):13-30, March 1973. 2 refs.*

In tracer experiments of elevated-source diffusion, sometimes two peak values occur in the vertical concentration profile, indicating two centerline-heights of concentration. The higher value corresponds to the tracer release height and the lower seems to correspond to the lower neutral or near-neutral layer. The vertical spread of concentration in the lower layer is larger than that in the upper layer. In this circumstance, the surface concentration near the source is mostly determined by the diffusion from the lower-level centerline height of the plume. Possibly the meteorological conditions conducive to a split centerline height are dependent on a thermal stratification in which the upper stable layer lies on the lower unstable layer when the tracer is released in the upper layer. In this experiment the tracer release height was 200 m, and there is no evidence that the same phenomenon occurs at a release height of 300 m or more. When the effective stack height is 200 to 300 m, a very high surface concentration near the source may occur.

36070 **APTIC NO. 58410**

Sato, Junji

DISPERSION OVER AN URBAN AREA. *(Toshi iki ni okeru kakusan). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):394, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 133.)*

The data from diffusion experiments conducted in Omuta, Himeji, and Osaka using tracers were analyzed; they were compared with the tracer dispersion experiments conducted in St. Louis, Johnstown, and Fort Wayne, and diffusion parameters in each city were obtained and presented in a graph. The stack height, vertical concentration distributions, and temperature zones are discussed for the three Japanese cities.

36071 **APTIC NO. 58338**

Senshu, Toshio

ON THE RELATION BETWEEN METEOROLOGICAL PARAMETERS AND CONCENTRATION OF SMOG. *(Koengen kara no haien chijo nodo to kisho inshi no kankei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):397, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 136.)*

The theoretical values of smoke dispersion obtained by simplified mathematical models were compared with actual measurements taken at various locations. The measurements were taken using cobalt sulfate, fluorescent particles, and freon gas as tracers. The standard error was less than 20%. The results showed that the Sutton plume dispersion coefficient value tends to decrease when the wind velocity increases; the less stable the air, the greater the coefficient. The horizontal dispersion coefficient slightly increases in a slight breeze, but the value does not depend so clearly on the wind velocity or on atmospheric stability as the plume coefficient. The method for obtaining the coefficient ratio is discussed, and parameters are examined.

36072 **APTIC NO. 58576**

Shikata, Hiroshi and Riichi Komabayashi

PLUME RISE ESTIMATES FOR THERMAL POWER STATIONS. *(Karyoku hatsudensho haien no josho kodo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):551, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 276.)*

Observations from 12 tests conducted at eight thermal power plants on the plume behavior and height findings are reported. The experiments have been conducted since 1953, but these data are on the use of visible stack gas behavior conducted between October and March, and July and August. The scale of the plants is 125-600 Mw, the stack height 100-200 m. A black smoke tube was inserted in the flue and the smoke was made visible. The horizontal plume behavior was observed by a fish-eye lens from the base of the stack, and the altitude of dispersion was measured by a press camera from distances of 1-3 km. For one observation, 12 to 16 photographs were taken at intervals of 20 sec. Meteorological factors were observed by anemometers, thermometers, kitoons and balloons. The measurements were rather unstable, but agreed quite well with the revised formula of Bosanquet II. Mathematical analyses are presented.

36073 **APTIC NO. 58426**

Shimanuki, Kojiro and Kazuo Sato

ON AIR POLLUTION IN THE IWAKI AREA. *(Iwaki chiku taiki osen ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):497, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 227.)*

The capacity of the telemeter system in the Iwaki City, Konahama District is described. The system utilizes a minicomputer at the center and forms a network of 28 monitoring stations; the data from each monitoring station are recalled every 10 minutes and prints every hour. The Iwaki industrial belt is developed along the coastline, and the area s pollution depends very much on the meteorological patterns. The land breezes at night are irregular, and the sea breezes during the day are quite stable. With the invasion of sea breeze from south, pollution in the area progresses. During the halcyon periods of the sea and land breeze changed over between 7-8 am and 7-8 pm, air pollution in the area does not progress. Therefore, pollution in the Konahama area is completely by transport of gases from the industrial belt.

36074 **APTIC NO. 58498**

Shiozawa, Kiyoshige, Atsushi Ootaki, and Shin ichi Okamoto

A MULTIPLE BOX MODEL FOR ESTIMATING AIR POLLUTION IN URBAN AREAS. *(Taju bakkusu-gata moderu ni yoru toshi taiki osen no suitei). Text in Japanese. Waseda Daigaku Rikogaku Kenkysho Hokoku (Bull. Sci. Eng. Res. Lab., Waseda Univ.), no. 61:40-47, 1973. 12 refs.*

Urban air pollution prediction models were studied. A multiple box model was developed which expresses the complicated wind field by using many observations from the meteorological monitoring network. The urban atmosphere under the lid (thermal stable layer) is an airshed, and it is subdivided into many rectangular boxes. The wind velocity components of each box are calculated by the weighted-average method. This model was applied to the Tokyo metropolitan area by introducing known specific meteorological conditions and an emission inventory. A preliminary trial of the box model was used to calculate hourly sulfur dioxide concentrations for several days in the winter. This model was tested against hourly and 24-hour averaged SO2 data from air quality monitoring stations.

36075 **APTIC NO. 58533**

Slob, W. H. and W. P. A. G. Ottevanger

MEASUREMENTS OF AITKEN NUCLEI, CLOUD NUCLEI, AND ICE NUCLEI IN PRECIPITATION AT THE JUNGFRAUJOCH, SWITZERLAND. *Arch. Meteorol. Geophys. Bioklimatol. Ser. B, 21(4):349-363, 1973. 13 refs.*

Aitken nucleus concentration measurements with a photoelectric counter at the Jungfraujoch show a maximum at almost neutral stability of the air in the layer up to 3500 m. Simultaneous measurements with a thermal diffusion chamber and an Aitken nucleus counter show that in stable conditions a high percentage of the Aitken nuclei (average 69%) is also active as cloud nuclei (supersaturation less than 1%). In unstable conditions, such as snow, however, the percentage of Aitken nuclei that can act in this way is normal or very low (average 20%). Aitken nuclei are removed from the atmosphere by washout in snow. Ice nucleus measurements in snow normally show an exponential increase of the number of active ice nuclei with decreasing temperature. In some observations a high ice nucleus coincides with low Aitken nucleus concentrations. Even at rather high temperatures the clouds at the Joch were completely glaciated, probably because of ice crystals blown up from the snow fields. (Author summary)

36076 **APTIC NO. 59068**

Szepesi, Deszo J.

GENERALIZED MODEL FOR AREA SOURCES. *VDI (Ver. Deut. Ingr.) Ber., no 200:123-127, 1973. 6 refs.*

To estimate the rate of dispersion of emissions originating from area sources, a generalized model was developed. For practical applications of the theoretical results, the determination is necessary of the initial dispersion horizontal and vertical crosswind components. These can be determined by measurements, observations, or estimates. Methods of different accuracy for these determinations are recommended. For the validation of the initial dispersion estimation rates, half-a-year field measurements were carried out at 50 measuring points 10 km around a cement plant. If the initial rates were taken into consideration, the calculated territorial distribution was in good agreement with the measured one, otherwise there were significant differences. (Author abstract modified)

36077 **APTIC NO. 58450**

Takahashi, Takeo, Eip Ebisawa, and Katsuhisa Taguchi

ON THE SULFUR DIOXIDES IN KASHIMA DISTRICT. *(Kashima chiku no taiki osen ni tsuite (io sankabutsu to kisho)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollujtion), 8(3):499, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 229.)*

The sulfur oxides measurements in the Kashima area, Ibaraki Prefecture, were examined in the light of meteorological factors. The data on pollution were obtained from the telemeter monitoring stations. In this area, the predominant wind in the winter is northwest, in spring and autumn, northeast, and in summer, southwest. The SOx levels and these seasonal winds did not show a special relationship. In general, the SOx concentration is increasing every year in proportion to the total emission quantity. Monthly variation shows a pattern of increase in summer and decrease in winter, and the daily pattern shows an increase during the day and a decrease at night, forming only one peak between 4-7 pm. High concentration appears when the sea breeze appears from northeast to southeast in the lea, rather than at the closest monitoring station from the emission source but a little farther away. This seems to agree with the pattern of air currents investigated by the nonlift balloon. Inversion appearance is more frequent in November to February, but high SOx concentration appears more often between April and September. Thus the sea breeze seems to affect pollutant diffusion more than the inversion does.

36078 **APTIC NO. 58949**

Unsworth, M. H. and H. A. McCartney

EFFECTS OF ATMOSPHERIC AEROSOLS ON SOLAR RADIATION. *Atmos. Environ., 7(12):1173-1185, 1973. 25 refs.*

Calculations of the spectral distribution of visible radiation (270-710 nm) in the direct solar beam were made for three aerosol size distibutions at thin and dense concentrations and for solar zenith angles of 30 and 60 deg. Direct irradiance (270-2800 nm) was tabulated for each aerosol, and diffuse and total irradiance were estimated from an empirical relationship. Direct and diffuse irradiance and the fraction of visible to all-wavelength radiation in the direct solar beam were strongly dependent on aerosol size distribution; total irradiance was much less dependent. Calculations indicated that increasing aerosol concentration reduced the photosynthetically active radiation in the direct solar beam by up to 50%, while depletion of photosynthetically active total radiation was predicted to be markedly less. Radiation measurements at three sites in Britain illustrated that turbidity depended mainly on air mass origin, local sources of aerosol being relatively unimportant. Mean monthly values of a turbidity coefficient calculated for summer months at five meteorological office sites showed that turbidity in Britain was greatest in southeast England. (Author abstract modified)

36079 **APTIC NO. 59065**

Velds, C. A.

TRANSPORT OF SULFUR DIOXIDE INTO THE NETHERLANDS. *VDI (Ver. Deut. Ingr.) Ber., no. 200:167-168, 1973.*

An investigation was made into the possible transport of sulfur dioxide across the German-Netherlands border. Using daily weather maps and trajectory analyses at 10 m and 900 m altitudes, it appeared that SO2 was transported with southerly winds from the German Ruhr area up to the city of Enschede 100 km northward. (Author abstract)

36080 **APTIC NO. 58534**

Wartena, L., C. L. Palland, and G. H. v. d. Vossen

CHECKING OF SOME FORMULAE FOR THE CALCULATION OF LONG WAVE RADIATION FROM CLEAR SKIES. *Arch. Meteorol. Geophys. Bioklimatol., Ser. B., 21(4):335-348, 1973. 9 refs.*

The validity of a number of formulae for the calculation of long wave radiation from a cloudless atmosphere have been examined on the basis of 2 years of observation performed at Deelen aerodrome. The formulae examined are those of Brunt and Swinbank and six modifications of these. Of these eight formulae, that of Brunt appeared to give the best fit to the observations. Because the parameters in the formulae will depend on the air mass properties (temperature, humidity, pollution), the data were grouped as to month and wind direction. Statistically, no preference for one of these groupings could be proved.

36081 **APTIC NO. 59274**

Wolfermann, H. F.

SPREAD OF MALODOROUS EMISSIONS FROM AREA SOURCES. *(Ausbreitung geruchsintensiver Stoffe bei Flaechenquellen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 200:221-223, 1973.*

Experiments on the dispersion of malodorous emissions from cattle barns are described. The specific odor of barn emissions is due to the presence of protein decay products, such as trimethylamine, hydrogen sulfide, ammonia, indole, and skatole. Emissions from cow barns are discharged at 1.80-2.00

m altitude or immediately underneath the roof. Odors are perceptible usually at distances of up to 200 m. The dilution of the emissions is heterogeneous, because alternate zones of odorless air and malodorous air were observed. The odor nuisances are most intense during periods with high ambient temperature and low wind speed. Dilution factors of 380 m in a calm atmosphere, 156 at a wind speed of 3 m/sec, and 440 at a wind speed of 5 m/sec were determined at 6 m distance from the outlet. Effective dilution of malodorous emissions requires dilution immediately after the emission source. Emissions close to the ground level should be avoided.

36082 **APTIC NO. 58365**

Yagi, Yasuo, Toshiki Oshio, Fujinhiko Go, Yoshinori Ishikawa, and Akihiko Yoneda

APPROACHES TO THE DESIGN OF CALCULATING ANALYSIS ON AIR POLLUTION IN OSAKA. (PART I). *(Osaka chiiki no taiki osen kaiseki ni tsuite, sono 1). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):512, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 242.)*

The fixed source of air pollution emission sources in the Osaka area were investigated by simulation calculations of 1 sq km blocks. Pollutants calculated were sulfur oxides, nitrogen oxides, particulates, and carbon monoxide. The plants with more than 2 kl of consumption of fuel a day were considered point emission sources, and those with less than 2 kl fuel consumption per day were classified as area pollution sources, and the total emission per 1 sq km area was calculated. Data from individual plants for fuel consumption, sulfur content, stack height, emission, and coordinates were obtained; unit emission quantity by source for nitrogen oxides and dusts were obtained; effective stack height of point sources, and collective emission by heights were obtained; dispersion formula, dispersion parameters, and meteorological conditions were applied; and calculations were obtained for both point and area sources.

36083 **APTIC NO. 58571**

Yamada, Keiko, Takeo Hashimoto, Masayoshi Okamoto, Hiromi Yoshida, and Toru Fujii

APPLICATION OF TEMPERATURE DIFFERENCE TO THE ANALYSIS OF THE EARTH S SURFACE POLLUTION POTENTIAL AT A BROAD AREA. *(Ondosa o mochiita koikinai no chihyo osen potensharu no kaiseki - I). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):440, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 174.)*

The temperature differences of 20 weather observation stations on the Mount Ikoma (626 m) and Osaka areas were used to study the stability of the lower atmosphere and the information was used for prediction of potential smog pollution. The temperature differences were obtained for each hour at 20 stations, and the cumulative figures between 9 pm and 9 am were plotted on cumulative curves and the material was fed into a computer. The total data between Nov. 1971 and March 1972 on smog warnings, wind direction and velocity, and sulfur oxides concentration were also put into the computer. Four general types were obtained: the entire curves dropping overnight during 12 hr; total curves rising overnight; rising curves grouped into about three types; and rising curves dropping in the middle. Types 3 and 4 predicted smog warnings, and type 2 could lead to smog. To a certain extent, regularity of the temperature differences and smog occurrences were recognized.

36084 **APTIC NO. 59286**

Yamamoto, Susumu and Osayuki Yokoyama

AIRPLANE MEASUREMENTS OF ATMOSPHERIC DIFFUSION OVER A CITY. *(Toshi ni okeru taiki kakusan no hikoki kansoku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):392, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 131.)*

The intensity of turbulence and the quantity of heat transport were measured above Tokyo and south Saitama. An airplane was used, and the three-dimensional distribution in the city and suburbs, time variations, and the structure of atmsopheric interfaces and pollutant dispersions within layers were examined. The tests were conducted in August of 1972 and 1973. The turbulence was measured by thermal line anemometer and ultrasonic anemometer-thermometer at the heights of 200, 300, 500, 700, 1000, 1500, and 2000 m, in the direction of wind for 30 km. Each flight at a given height was divided into several run sections, and the parameters of the main wind, vertical elements, thermal fluctuations, and thermal transport were examined.

36085 **APTIC NO. 58820**

Yoshikawa, Akira, Akikazu Kaga, and Takuji Tokuhiro

AIR POLLUTION IN AMAGASAKI. *(Amagasaki-shi ni okeru taiki osen ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):548, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 273.)*

Mass emission sources of air pollutants are concentrated on the southern sea coast in Amagasaki. The characteristics of sulfur oxide concentration hourly values, dispersion, the wind directions and velocities were investigated, and actual measurements and calculations were compared. Checking the cumulative frequency distribution patterns showed that the dispersion rate was slightly smaller when the wind was SW. The land and sea breeze seemed to have cyclic characteristics. Acutal measurements and calculations showed considerable differences, with some general similarities. In general, a combination of atmospheric movements, pollutant transports from other cities, and time changes of the wind direction and speed seemed to make the dispersion patterns complex.

36086 **APTIC NO. 58891**

Yutani, Soshi

A PRELIMINARY ANALYSIS ON OXIDANT DISTRIBUTION AND PHOTOCHEMICAL SMOG IN OSAKA. *(Osaka chiku ni okeru okishidanto nodo bunpu ni tsuite no 2,3 no kaiseki (II)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):559, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 282.)*

The daily fluctuation of oxidant concentration distribution in Osaka is analyzed. The daily fluctuation of hourly averages between 1:30 and 2:30 pm in summer can be analyzed by the following three or four patterns: Factor 1 (80% contributive) is related to central Osaka; 2 (10% contributive) is related to the southern shore of Osaka Bay; 3 (5% contributive) is related to the upper Yodo River, adjacent to southern Kyoto; 4 (3%) is related to 3. To analyze the significance of these factors, existing data on pollution and temperature, wind direction, wind velocity, suspended particulates related to radiation are studied. The temperature distribution has a constant pattern and contributes about 90% to oxidant distribution fluctuations.

36087 **APTIC NO. 58732**

CHEMIST-METEOROLOGIST WORKSHIP-1973. *January 15-19, 1973. Ft. Lauderdale, Florida. Atomic Energy Commission, Div. of Biomedical and Environmental Research and Environmental Protection Agency, Div. of Meteorology, 48p., 1973.*

NTIS: WASH 1217-73, GPO

The panel recommendations of the Third Chemist Meteorologist Workshop are presented. Panel 1, Regional Air Pollution Studies, includes the acquisition of data from field measurements and the development and testing of simulation models which synthesize the significant processes of environmental change and effect. The recommendations of panel 2, Deposition and Removal Processes, center on research needs regarding dry deposition processes, wet removal processes, and the characteristics of airborne pollutants and receptor properties important to these processes. Panel 3, Global Budgets, was concerned with the sulfur cycle, the oxides of carbon, the atmospheric nitrogen cycle, hydrocarbons, halogens, gaseous heavy metals, hydrogen, radioactive gases, and aerosols. Panel 4, the Panel on Photochemical and Transformation Modeling of Pollutants concerned itself almost entirely with the formulation, development, and use of mathematical models for the description of chemical processes occurring in the atmosphere and in laboratory experiments. The recommendations were classified in terms of the nature of the model, meteorological input, chemical input, general, and stratospheric modeling.

1972

36088 **APTIC NO. 59217**

Benarie, M., A. Nonat, and T. Menard

STUDY OF THE TRANSFORMATION OF SULFUR DIOXIDE TO SULFURIC ACID IN RELATION WITH CLIMATOLOGIC DATA IN AN INDUSTRIALIZED URBAN AREA (ROUEN). *(Etude de la transformation de l anhydride sulfureux en acide sulfurique en relation avec les donnees climatologiques, dans un ensemble urbain a caractere industriel (Rouen)). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 37p. 38 refs. (May 3-5.)*

The atmospheric oxidation of sulfur dioxide to sulfuric acid aerosol was studied during the winter of 1969/1970 at seven sites in the Rouen region. The H2SO4 studied was that determined selectively by the microdiffusion method and not the stochiometric value computed from hydrogen ion or sulfate concentrations. The reaction is governed by the catalytic action of the suspended solid matter. Compared with this influence, the acceleration of the reaction by ammonia appears slight, and the action of nitrogen dioxide seems even less definite. No photochemical action is perceptible. The overall effect of fog is rather of diminution of the H2SO4 aerosol concentration. Under the observed conditions, and with the approximating assumptions which are made, the lower limit of estimation of the reaction rate is between 6 and 25% per hour. As a mean value, during wintertime, in the Rouen region, 7.1% of the total airborne sulfur of the atmosphere is in the form of H2SO4.

36089 **APTIC NO. 59457**

Daye, Richard L.

AFGWC AIR STAGNATION MODEL. *Air Force Global Weather Central, Offutt AFB, Nebr., Systems Analysis and Design Branch, AFGWC(DN)TN-72-6-1, 12p., May 15, 1972. 8 refs.*

NTIS, DDC: AD 743304

An air stagnation model was designed to provide air stagnation data to Air Force installations located overseas where mesoscale data are available. Parameters were derived from boundary layer model data and mesoscale prediction model data. Precipitation forecasts from a macroscale cloud module were also used. Since the boundary layer model forecasts were only available through 24 hours, the 36-hour outlook used data from a macroscale baroclinic prediction model, the macroscale cloud module, and the 1000-mb prognostic model. The air stagnation data included mixing depth, transport wind in the mixing layer, ventilation value in the mixing layer, meteorological stagnation index (MSI), times of maximum and minimum MSI, and the maximum and minimum MSI. (Author abstract)

36090 **APTIC NO. 59464**

Deirmendjian, D.

ON VOLCANIC AND OTHER PARTICULATE TURBIDITY ANOMALIES. *Rand Corp., Advanced Research Projects Agency Contract, 54p., March 1972. 47 refs. (This is a condensation of R-886-ARPA.)*

NTIS, DDC: AD 748975

Information on anomalous, long-lived changes of turbidity over large portions of the earth are reviewed in order to estimate the amount and nature of the turbid components in each case. This information in turn may be correlated with the nature and magnitude of the climatic effects, if any, in an effort to understand the responsible mechanism so that future effects can be predicted. Volcanic explosions cause one type of large turbidity anomaly by injecting large quantities of volcanic dust into the atmosphere which can alter its normal optical properties. Literature is reviewed on three volcanic events which occurred within the last 100 years and produced widespread turbidity anomalies, Krakatoa, Katmai, and Agung. Various optical phenomena are discussed including blue or green sun and moon, Bishop s Ring, and twilight and crepuscular phenomena. Climatic effects of volcanic dust include reduction of insolation, and reduction of mean temperature, related to the magnitude of dust and the optical thickness anomaly. Supersonic aircraft emissions may also cause particulate loading and meteorological changes; however, some studies show that SST turbidity anomalies will hardly exceed the background turbidity found above mountains on clear days away from city pollution, and thus climatological disturbances may be negligible.

36091 **APTIC NO. 59060**

Haenel, Gottfried

EVALUATION OF PHYSICAL PROPERTIES OF SAMPLES OF ATMOSPHERIC AEROSOL PARTICLES AS FUNCTIONS OF THE RELATIVE HUMIDITY. *Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 9p. 5 refs. (May 3-5.)*

A micro gas pyknometer was used to measure density of aerosol particles in the microliter range. The mass, volume, and the real part of the mean index of refraction were also measured as functions of relative humidity. These data can be used to compute the way in which the extinction coefficient of the freely suspended aerosol particles depends on the relative humidity. The aerosols were collected at Mainz during foggy weather, at 1000 m above sea level on a mountain, and on board a ship in the Atlantic. The variation of the extinction coefficient with the relative humidity is proportional to the variation of the sum of the particle cross-sections with the relative humidity according to an equation. In the range of relative humidity less than or equal to 0.95, this result is independent from the particle size dsitribution and from the wavelength of light in the visible region.

36092 **APTIC NO. 59043**

Hitchcock, Dian R. and Alfred E. Wechsler

BIOLOGICAL CYCLING OF ATMOSPHERIC TRACE GASES. (FINAL REPORT). *Little (Arthur D.), Inc., Cambridge, Mass., National Aeronautics and Space Administration Contract NASW-2128, 419p., March 1972. 336 refs.*

NTIS: N72-24057

A detailed critical review is presented on the influence of biological processes on the cycling of selected atmospheric gas constituents which include methane, carbon monoxide, gaseous compounds of nitrogen (nitrous oxide, ammonia, nitric oxide, and nitrogen dioxide), and gaseous sulfur compounds (hydrogen sulfide and sulfur dioxide). The study includes the identification of biological and other sources of each gas, a survey of abundance measurements reported in the literature, and a review of the atmospheric fate of each constituent. It also provides information on which to base conclusions regarding the importance of biological processes on the atmospheric distribution and surface-atmosphere exchange of each constituent and a basis for estimating the adequacy of present knowledge of these factors. Preliminary analyses are also provided for the feasibility of monitoring the biologically influenced temporal and spatial variations in abundance of these gases in the atmosphere from satellites.

36093 **APTIC NO. 59834**

Huertas, M. L., A. M. Marty, and M. Puech

STUDY OF THE NATURE AND OF THE AGGLOMERATION OF ATMOSPHERIC IONS. THE INFLUENCE OF ORGANIC VAPORS. *(Etude de la nature et de l agglomeration des ions atmospheriques. Influence des vapeurs organiques). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Pollueès, Proc., Paris, France, 1972, 6p. 9 refs. (May 3-5.)*

The influence of organic vapors on the agglomeration of atmospheric ions was studied. Certain vapors, such as those of gasoline, benzene, and hexane, had no influence on the ion agglomerates, while others, such as methanol, ethanol, acetone, trichloromethane, nitrobenzene, nitromethane, and vapors escaping from turpentine and other natural essences, reduced the ion mobility, thus causing agglomeration of ions. The agglomerating ability of such organic vapor appears to be associated with their considerable permanent dipole momentum. Agglomeration of vapors with zero dipole momentum was not observed.

36094 **APTIC NO. 59234**

Jansen, P., S. Jordan, and W. Schikarski

COMPARATIVE MODEL THEORY OF THE ATMOSPHERIC POLLUTANT LOAD CAUSED BY POWER PLANTS. *(Vergleichende Modelltheorie der atmosphaerischen Schadstoffbelastungen durch Kraftwerke). Text in German. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Pollueès, Proc., Paris, France, 1972, 10p. 32 refs. (May 3-5.)*

A model theory of the air pollutant loads caused by conventional and nuclear power plants, and future development of the pollutant loads on the basis of the expected energy production and of the maximum allowable ground level concentrations is presented. The pollutants concerned are sulfur dioxide, nitrogen oxides, dust, and fluorine compounds as well as xenon-113 and krypton-85. The specific SO2, dust, nitrogen oxide, and fluorine emissions from coal are 6.0-7.7; 1.4-2.7; 1.4-4.6, and 0.05-0.11 g/per kWh. The corresponding values for oil are 7.4 g of SO2, 0.7 g of dust, 1.5-3.4 g of nitrogen oxides, and 0.004 g of fluorine per kWh. Natural gas produces 0.002 g of SO2, and 0.7-3.1 g of nitrogen oxides per kWh. The hold time of air pollutants in the atmosphere is dependent of their concentrations, high concentrations corresponding to short decay times. The hold time of SO2, dust, nitrogen oxides, and fluorine in the atmosphere is 1-6 days, 3-7 days, 1-3 days, and 3-7 days, respectively. The average yearly ground level concentration of SO2 and nitrogen dioxide in polluted areas is 150 micrograms/cu m and 50 micrograms/cu m. Nuclear energy is about 1000 times less polluting than either coal or fuel oil, while natural gas is about 100 times better than the fossil fuels. The energy generation facilities operating currently are susceptible to creating considerable pollution even under normal meteorological conditions, while concentrations exceeding the maximum allowable levels by two orders of magnitude occur during inversions.

36095 **APTIC NO. 59224**

Malet, L. M.

PRACTICAL METHOD FOR THE EVALUATION OF THE DILUTION FACTORS OF AIR POLLUTANTS EMITTED BY A CONTINUOUS PUNCTIFORM HIGH EMISSION SOURCE. *(Methode pratique d evaluation des facteurs de dilution des effluents issus d une source ponctuelle elevee a emission continue). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Pollueès, Proc., Paris, France, 1972, 10p. (May 3-5.)*

A practical method developed by the Nuclear Energy Research Center in Mol (Belgium) for the evaluation of the dilution factors of emissions from continuous, high emission point sources is described. The groundlevel concentration of such emissions can be calculated from an equation as a function of the source intensity, the dilution factor, the distance from the source, the effective discharge height, the height of an inversion layer above the effective discharge height, standard deviations of the lateral and vertical distributions of the effluents in the plume at a given distance from the source, and the mean wind speed at the plume height. A comparison of data calculated by the Mol method with tracer analyses shows good agreement of the results under similar emission conditions and for punctiform source heights comprised between 30 and 200 m.

36096 **APTIC NO. 58752**

Moore, D. J.

THE EFFECTS OF ATMOSPHERIC STABILITY AND WIND SPEED ON THE ONE-HOUR AVERAGE GROUND LEVEL CONCENTRATIONS OF SULPHUR DIOXIDE EMITTED FROM TALL STACKS. *Inst. Natl. Rech. Chim. Appl. Dixieme Colloq. Atmos. Pollueès, Proc., Paris, France, 1972, 10p. 6 refs. (May 3-5.)*

The maximum hourly average sulfur dioxide concentrations downwind of tall chimneys are represented more closely by an expression of the form rate of emission/(wind speed times cube of plume height) than by the classical expression in which the denominator contains the square of the plume height. The numerical factors which appears in the numerator if the above relation is expressed as an equality now has the dimensions of a length and the relationship of this length parameter with wind speed and stability is discussed. (Author abstract)

36097 **APTIC NO. 59453**

Read, Robert G.

AIR FLOW LAND-SEA-AIR INTERFACE. MONTEREY BAY, CALIFORNIA - 1971. *California State Univ., Moss Landing Marine Labs., National Oceanic and Atmospheric Administration Grant 2-35137, CASUC-MLML-TP-72-04, TP-72-4, MLML 29, 27p., 1972. 4 refs.*

NTIS: COM-7211137

Air-flow at the land-air-sea interface influences the atmospheric conditions that determine the dilution, transport, and trapping of natural and man-made air pollutants in the coastal areas of Monterey Bay and the Salinas Valley. The hourly air flow in these areas was analyzed on a daily and monthly basis. Patterns of stagnation were found from midnight to noon of the following day with moderate to strong air flow during 1300 to 2200 hours. Throughout 1971, whenever the flow was greater than 5 mi/hr, the prevailing wind direction was onshore and from a westerly direction. Suggestions for urbanization and industrialization are made on the basis of an understanding of the atmospheric conditions which lead to trapping and dispersal of atmospheric waste. (Author abstract)

36098 **APTIC NO. 59583**

Shirley, Earl C.

AIR QUALITY MANUAL. A METHOD FOR ANALYZING AND REPORTING HIGHWAY IMPACT OF AIR QUALITY. *California Division of Highways, Materials and Research Dept., Rept. CA-HWY-MR657082S-6-72-14, 34p., July 1972. 7 refs.*

A California Division of Highways air quality manual on the method for analyzing and reporting highway impact on air quality has been prepared as part of a program designed to train district personnel in assembling air quality reports. Topics covered include: legal requirements for environmental studies; air pollution phenomena (photochemical reactions, wind speed, turbulence, source strength, and mixing depth); pollutant effects on the air; component parts of an air quality study (characterization of source strength, transport and dispersion of pollutants, mathematical analysis, and ambient air quality); data presentation; written and tabular data summary; visual aids; response to questions for an environmental impact statement; report outline for an air quality study; building an aerometric data bank; out-of-house studies; and a systems approach to air quality studies. An actual request for proposal used by one of the California districts is included in an appendix.

36099 **APTIC NO. 59456**

Siegel, Robert

CALCULATION OF IRROTATIONAL WIND PATTERN WITH APPLICATION TO CLEVELAND TOPOGRAPHY. *Lewis Research Center, Cleveland, Ohio, National Aeronautics and Space Administration TM-X-2653, Work Unit 501-24, LRC-R-E-7039, 25p., Oct. 1972. 9 refs.*

NTIS: N73-10610

Small perturbation theory was applied to compute the deflection of the wind blowing across land that has irregular topography. The method was first applied to the flow around a single hill of Gaussian profile. Then calculations were made for the irregular topography on the east side of Cleveland where the elevation changes by several hundred feet. The topography produced small wind deflections that would not be of practical importance in air pollution dispersion studies. The calculations were for a neutrally stable atmosphere. Although they were not investigated, other factors such as thermal stratification of the atmosphere, diurnal variations, and convection currents resulting from thy proximity of Lake Erie and the city heat island effect are expected to be more significant than the influence of topography. (Author summary modified)

36100 **APTIC NO. 59507**

Smith, F. B. and G. H. Jeffrey

THE PREDICTION OF HIGH CONCENTRATIONS OF SULPHUR DIOXIDE IN LONDON AND MANCHESTER AIR. *North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Modeling, 3rd Meet., Paris, France, 1972, p. XVIII-1-XVIII-6. (Oct. 2-3.)*

Three mathematical forecasting schemes have been developed for predicting sulfur dioxide concentrations over the cities of London and Manchester. The first was developed to provide a forecast of whether or not certain threshold concentrations will be exceeded, while the second was developed to predict the actual magnitude of the daily average concentration. The last scheme was initiated as a simplified, albeit slightly less accurate, version of the second scheme. Meteorological parameters that were found most relevant were: the minimum temperature, wind speed, wind direction, and mixing depth. The schemes generally showed very satisfactory success in both cities and were much superior to persistence forecasting (today s concentration estimate is yesterday s concentration).

36101 **APTIC NO. 59508**

Smith, F. B.

A SCHEME FOR ESTIMATING THE VERTICAL DISPERSION OF A PLUME FROM A SOURCE NEAR GROUND LEVEL. *North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Meeting, 3rd Meet., Paris, France, 1972, p. XVIII-1-XVII-14. (Oct. 2-3.)*

A new scheme is outlined which brings up to date and enlarges upon an earlier scheme by Pasquill developed to estimate vertical dispersion of a neutral plume downwind from a near ground-level source when preferred direct measurements of the vertical fluctuations of the wind are unobtainable. The scheme utilizes numerical solutions of the diffusion equation up to 100 km downwind with profiles of wind and diffusivity suggested by actual measurements in unstable, neutral, and stable conditions. Measurements long-range diffusion and a better understanding of the nature of the whole boundary layer have both contributed to the changes. Account is taken of the effects of time of day, month, surface roughness, wind speed, incoming solar radiation, and overall stability. Factors which are possibly important but have yet to be considered are: the effect of significant topographical features and thermals carrying parts of the plume up to cloud level.

36102 **APTIC NO. 59510**

Velds, C. A.

AIR POLLUTION EPISODES AND MATHEMATICAL MODELS. *North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Modeling, 3rd Meet., Paris, France, 1972, p. XIV-1-XIV-10. (Oct. 2-3.)*

Meteorological parameters and concentrations of sulfur dioxide were measured for the heavily industrialized Rijnmond area in an effort to study the relationship between these variables and the nuisances (eye irritation, odors) experienced by the public during an air pollution episode. More than 200 complaints were made on days with a mixing height less than 500 m and a mean wind speed less than or equal to 4.5 m/sec, a mixing height between 500-1000 m and a mean wind speed less than or equal to 2.5 m/sec, a mixing height between 1000 and 1500 m and a mean wind speed less than or equal to 2 m/sec, or a mixing height greater than 1500 m and a mean wind speed less than or equal to 1.5 m/sec. A ventilation factor of less than 3000 sq m/sec increased the chances of increase in the number of complaints. Any relationship between meteorological parameters and SO2 concentrations and the nuisances experienced appeared to be overruled by small variations in the meteorological parameters and perhaps the emissions, making the use of a mathematical model for such situations practically impossible.

36103 **APTIC NO. 59490**

STUDY OF THE POLLUTION OF AN INDUSTRIAL SITE BY SMOKE TRACING. APPLICATION TO THE FEYZIN REFINERY (R. SARTEUR - ELF-UNION - B. P. 22 - 69-ST-SYMPHORIEN-D OZON). INTRODUCTION - NATURE OF REFINERY-GENERATED POLLUTION. *(Etude de la pollution d un site industriel par tracage des ses fumees. Application a la raffinerie de Feyzin R. Sarteur - Elf-Union - B. P. 22-69-St-Symphorien-d Ozon Introduction - nature de la pollution d une raffinerie). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 9p. (May 3-5.)*

The dispersion of the sulfur dioxide emissions from the Feyzin refinery, and the contribution by this refinery to the SO2 concentrations in Lyon were studied by the tracer technique. Sulfur hexafluoride was used as a tracer for cryogenic determination. Wind speed, wind direction at ground level, wind speed and direction at altitude, statistical distribution of wind directions, and the thermal gradient of the atmsophere were also measured in parallel with the measurement of the sulfur hexafluoride and SO2 concentrations at distances of 1 to 35 km off the source. The contribution of the refinery SO2 emissions to the SO2 concentrations in Lyon was found negligible, partly due to the thermal lift above the city. The influence of the refinery SO2 emission was highest at a distance of 2-5 km and declined to 1.5% and 0.13% at 0.8 and 8 km.

36104 **APTIC NO. 59505**

California Division of Highways, Materials and Research Dept.

AIR QUALITY MANUAL. APPENDIX: MATHEMATICAL APPROACH TO ESTIMATING HIGHWAY IMPACT ON AIR QUALITY. (FINAL REPORT). *Rept. CA-HWY-MR65082S-4-72-12, 109p., July 1972.*

Appendices to a California Division of Highways air quality manual on a mathematical approach to estimating highway impact on air quality are provided under separate cover. Graphical representations are presented for mathematical functions concerning the following: grade sections, non-parallel wind; elevated sections, non-parallel wind; cut sections, non-parallel wind; parallel wind; dispersion parameters; and emission factors.

1971

36105 **APTIC NO. 59481**

Abramov, R. V.

DUST IN THE ATMOSPHERE OVER THE ATLANTIC OCEAN. *(Pyl v atmosfere nad atlanticheskim okeane). Usloviya sedimentatsee v Atlanticheskon Okean. Izd. Nauka Moskva, 1971:7-30. Translated from Russian. Israel Program for Scientific Translations, 28p., 1972. 72 refs.*

NTIS: TT 72-50018

Sources and modes of transport of natural dust deposited over the Atlantic Ocean, mostly north of the equator, are reviewed. Participation of the atmosphere in recent sedimentation on the bottom of oceans is beyond doubt, although its role in transporting material of various origin is not clear. The active role of atmospheric processes is clear in the case of eolian deposits, and atmospheric influences are a major factor in erosion. The turbulence of atmospheric movements increases the quantity of comminuted material removed from land surfaces; air currents transport dust over large distances; and descending air currents and atmospheric precipitation, to a certain extent, facilitate dustfall over the oceans. Material such as volcanic dust is transported by the atmosphere with the possibility of appreciable alterations in the basic parameters of atmospheric circulation. The atmosphere may be regarded as a passive medium, damping the meteoric particles, in the case of cosmic dust.

36106 **APTIC NO. 58649**

Calder, K. L.

A CLIMATOLOGICAL MODEL FOR MULTIPLE SOURCE URBAN AIR POLLUTION. *North Atlantic Treaty Organization Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Modeling, 2nd Meet., Paris, France, 1971, p. I-1-33. 25 refs.*

A revised form of a climatological model for multiple source urban air pollution which was originally proposed in 1968 by D. O. Martin and J. A. Tikvart for estimating long-term average concentration of gaseous pollutants in terms of appropriate point and area-source emission inventories for the urban area together with wind speed, wind direction, atmospheric stability, and mixing depth is described. The model has been applied to the estimation of three-month average sulfur dioxide concentrations in St. Louis, Missouri, during the winter of 1964-1965 and was found to systematically overcalculate the average concentration values, despite provision for SO2 removal processes and an estimation of a wind speed more representative of the transport and diffusion of pollutants from large, elevated point source. Some obvious shortcomings and sources of error are: use of a constant average emissions inventory; use of climatological data from a nearby airport weather station which is a poor indication of urban meteorological conditions; and a crude method for estimating the mixing depth in the model calculations. (Author abstract modified)

36107 **APTIC NO. 58633**

Croke, E. J., A. S. Kennedy, and K. G. Croke

AN ENERGY ALLOCATION MODEL FOR AIR POLLUTION EPISODE CONTROL. *Preprint, Inst. of Electrical and Electronic Engineers, New York, p. 572-578, 1971. 2 refs. (Presented at the IEEE Institute of Electrical and Electronic Engineers, Conference on Decision and Control, Miami Beach, Fla., Dec. 15-17, 1971, Paper F8-1.)*

Results are given of an exploratory study conducted at the Argonne National Laboratory in which atmospheric dispersion analysis was linked with modern control theory. Its initial objective was to introduce comprehensive air pollution episode control planning into the electric utility operations. The planning activity was based on the assumption that utility plants could switch from coal to natural gas for air resource management purposes. A computerized optimal episode control system for a subset of the power plant network was developed. The control system, which inputs standard meteorological parameters and power demand forecasts, generates a schedule of power load shifting and natural gas utilization for the duration of the pollution episode. This optimal control schedule represents a minimal cost, minimal gas use strategy which restricts the pollution levels produced by power plants to a maximum acceptable threshold level, within the limits of the real-time system operation and economic constraints, and the capacity of the power plant network to react to control measures. The strategy can be updated as rapidly as warranted by altered meteorological conditions, a changing power demand schedule, or unforeseen equipment failures. An actual episode in Chicago was used to test this control model. The model was used to give an optimal operating schedule by computer. Air quality resulting from use of this schedule was determined from at atmospheric diffusion model. (Author abstract modified)

36108 **APTIC NO. 59025**

Djolov, G. D. and D. L. Yordanov

TURBULENT DIFFUSION IN THE ATMOSPHERE S BOUNDARY LAYER AT UPPER TEMPERATURE INVERSION. *Dokl. Bolg. Akad. Nauk., 24(6):725-728, 1971. 4 refs.*

The turbulent diffusion of impurities in raised temperature inversions is theoretically studied. This inversion acts as a surface which limits the spread of impurities which reflect or partly pass through it. Inadmissible concentrations of impurities are observed in such cases at a considerable distance from the source of contamination. Turbulent diffusion is analyzed theoretically for impurities from a continuous point source. Numerical experiments are used to study the properties of inversion layers and to study the effect of the upper temperature inversion on the field of impurity concentration. The quantitative results obtained are in agreement with the qualitative concepts about turbulent diffusion at raised temperature inversions.

36109 **APTIC NO. 58874**

Foitzik, L., D. Spaenkuch, and E. Unger

THE SPECTRAL EXTINCTION FOR MODELS WITH COMBINED LOGARITHMIC GAUSSIAN DISTRIBUTION. *(Die spektrale Extinktion fuer Modelle mit kombinierten logarithmischen Gauss-Verteilungen). Text in German. Gerlands Beitr. Geophys. (Leipzig), 80(5):361-370, 1971. 14 refs.*

The spectral extinction coefficient in the region of 0.3-1.6 micron is discussed for a quantity of aerosol size distributions, which approach power distributions or show deviations in some radii intervals. The relative extinction coefficient of the aerosol particles is 1.50. It follows from comparisons with other optical sizes of the same aerosol models that the spectral extinction is especially sensitive to changes of the size distribution of the aerosol particles.

36110 **APTIC NO. 58766**

Giles, W. H., George G. McComb, and Conrad Simon

A PREDICTIVE MODEL FOR THE AIR QUALITY WITHIN AND AROUND NINE URBAN EXPRESSWAY CONFIGURATIONS. *Preprint, American Chemical Society, 17p., 1971. 2 refs. (Presented at the American Chemical Society, National Meeting, 161st, Los Angeles, Calif., March 28-April 2, 1971.)*

A predictive model for the air quality and carbon monoxide concentration within and around nine New York City urban expressway configurations was developed. The model was utilized to define the concentration isopleths over the test roadway and to calculate the concentration in discrete grid points over the roadway. The concentration was predicted to the zone of the nearest receptor. The model has the capability of distinguishing the influence of varying traffic speed and volume in each direction. This model should have wide applicability in defining urban and transportation planning parameters in meeting Federal Air Quality Standards.

36111 **APTIC NO. 58676**

Nonhebel, G.

AIR POLLUTION PROBLEMS FOR LARGE POWER STATIONS. *Inst. of Mechanical Engineers, London (England), Steam Plant Group and Koninklijk Inst. van Ingenieurs (Netherlands), Mod. Steam Plant Pract., Proc., Gravenhage, Netherlands, 1971, p. 1-14, 125-142. 28 refs. (April 28-30, Paper C61/71.)*

The reasons meteorological surveys should be made when sites are considered as development areas for use by large emitters of gaseous pollutants are discussed. Further general work is required to improve the accuracy of meteorological parameters in equations for plume rise, plume dispersion, and time-average ground-level concentrations. An account is given of the wind tunnel studies made of three coastal sites for new power stations, each site having high ground inland. In addition, reports are given of studies with smoke rockets. A method of avoiding visible dust emission by the installation and effective maintenance of electrostatic precipitators is considered, although the problem of persistent plumes of sulfur trioxide has not been solved. The use of dry cooling towers to eliminate unpleasant clouds of steamy vapor emitted by large stations is discussed. This would make it possible to site stations on high ground, thereby ensuring an improved dispersion of the flue gases. A comparison indicates that the reduction of the sulfur content of fuel oils at refineries, with the production of readily stored and saleable sulfur, is to be preferred to those processes which remove sulfur oxides from flue gases. Public attitude, visibility of chimney plumes, choide of chimney height, and topographic effects on plume dispersion are also mentioned. (Author abstract modified)

36112 **APTIC NO. 59461**

Roessler, F.

AEROSOL LAYERS IN THE ATMOSPHERE. *Deutsch-Franzoesisches Forschungsinstitut Saint-Louis and Inst. Franco-Allemand de Recherches de Saint-Louis, 18p., June 1971. 21 refs.*

NTIS: N7221373

Measurements of diffuse skylight were made with rockets and balloons near Hammaguir, Stuttgart, and Kiruna to determine the dust concentration in the atmosphere. The instrument and its calibration are discussed. Radiation at any altitude is determined by the differentiation of the curve of the monotonously decreasing light intensity. The resulting curve shows the existence of layers caused by light scattering of aerosols. The effect is intensified when the light is referred to the unit of mass instead of volume of the air. In this case the decrease of the air density with altitude is eliminated. Such processing makes layers clearly discernible at 25, 50, and 82 km, the exact altitude depending on the geographical latitude. The layer at 82 km is connected with the appearance of noctilucent clouds. By taking into account the factors of turbidity of these layers and correlating them with the dependence on angle and wavelength, the resulting distribution of sizes can be determined to contain a great amount of Aitken particles to reach agreement between experiment and calculation. With such a distribution, the number of particles and their weight is calculated.

36113 **APTIC NO. 58643**

Shiomi, M. T. and K. W. Kuntz

GREAT LAKES PRECIPITATION CHEMISTRY. PART I. LAKE ONTARIO BASIN. *Preprint, Canada Centre for Inland Waters, Burlington (Ontario), 58p., 1971. 57 refs.*

The chemical composition of bulk precipitation in the Lake Ontario basin was studied to determine its potential contribution to the chemical budgets of the lake and to provide basic background data as a base-line for later comparisons. The results from seven sampling stations during the 2-year period 1970-1971 are presented. The results suggest that bulk precipitation may be a significant source of nitrogen and phosphorus to the lake, with the nitrogen input estimated at 14-14% of the total from other sources and the phosphorus input from 5-14%. The bulk precipitation loadings of the major ions sodium, potassium, calcium, magnesium, chloride, and sulfate to the lake were less than 3% of the estimated Niagara River loadings of the same parameters. Comparisons of lake surface loadings of heavy metals by bulk precipitation in the Lake Ontario basin with estimated Niagara River loadings showed that bulk precipitation may be a significant source of lead and zinc to the lake. Bulk precipitation loadings were from 15 to 36% and from 58 to 85% of the estimated Niagara River loadings for lead and zinc, respectively. (Author abstract)

1970

36114 **APTIC NO. 59186**

Birot, A., B. Adroguer, and J. Fontan

VERTICAL DISTRIBUTION OF RADON 222 IN THE ATMOSPHERE AND ITS USE FOR STUDY OF EXCHANGE IN THE LOWER TROPOSPHERE. *J. Geophys. Res., 75(12):2373-2383, April 20, 1970. 14 refs.*

The diffusion of radon or any other atmospheric pollutant in the lower troposphere can be theoretically represented by the differential diffusion equation of the K theory. This equation has been solved numerically. In this model it is possible to choose any form of the diffusivity profile and of the vertical wind profile. The boundary conditions and the initial conditions can be modified according to the problem under consideration (geometry and intensity of the source, deposition at the earth s surface in the case of aerosols). In particular, this model has been used to study the diffusion of radon from a plane infinite source, a half-troposphere. The results have been interpreted by a meteorological anlysis; for certain data; the numerical model has been utilized. (Author abstract)

36115 **APTIC NO. 59190**

Matveev, A. A.

CHEMICAL HYDROLOGY OF REGIONS OF EAST ANTARCTICA. *J. Geophys. Res., 75(18):3686-3690, June 20, 1970. 4 refs.*

Samples of atmospheric precipitation, snow, and ice were collected during the IGY in East Antarctica at Mirny, Bunger Oasis (Dobrovolsky Station), Pioneerskaya, Komsomolskaya, Vostok, Sovetskaya, and the Pole of Relative Inaccessibility. The chemical composition of the precipitation, snow, and ice cover is influenced by the relief and climatic features of the Antarctic continent. Three distinctive zones can be identified in East Antarctica: the coastal strip, the oasis, and the inland region. The main feature of the chemical hydrology of the coastal strip is a comparatively high concentration of substances in precipitation, which, according to observations in 1958, ranged from 3.3 to 260.8 mg/l. The composition of atmospheric precipitation in this zone is influenced by the ocean. The relation of changes in the concentration of precipitation constituents to the dynamics of air masses over the region of observation, as well as to position of the drifting ice edge, was investigated. Precipitation in the ice-free surface area of the Antarctic oasis region is characterized by a predominance of carbonate, sodium plus potassium ions, and calcium ions. The results of hydrochemical investigations in the East Antarctica inland region show very low concentrations of substances in the snow. Fluctuations in the snow mineralization (total ion composition) are 1 to 4 mg/l in this zone. Show differs from that of the coastal strip by variations in ion concentrations. Calculation of the chemical ice runoff from an area 1.4 times 10 to the 6th sq km showed some excess in the accumulation of salts by precipitation over runoff. (Author abstract)

1966

36116 **APTIC NO. 59024**

Eiden, Reiner

THE ELLIPTICAL POLARIZATION OF LIGHT SCATTERED BY A VOLUME OF ATMOSPHERIC AIR. *Appl. Opt., 5(4):569-575, April 1966. 12 refs.*

The scattering of linearly polarized light by aerosol particles produces partly polarized light whose ellipticity was theoretically and experimentally investigated for the specific case of a continental atmospheric aerosol in a volume of air. With the Mie theory and under the assumption of various aerosol size-distribution models, the ellipticity was computed as a function of the scattering angle for various wavelengths. The computations were based on complex indicies of refraction equal to 1.5-0.0i, 1.5-0.01i, 1.5-0.1i, 1.44-0.0i, 1.4-0.0i, and 1.33-0.0i. The comparison between computed and measured values for the wavelengths of 0.45 micron to 0.65 micron disclosed for a dry aerosol a real part of the refractive index equal to 1.5 and an imaginary part equal to 0.01 less than or equal to the coefficient of absorption less than 0.1. With a moist aerosol, the real part of the refractive index and the imaginary part both decrease. (Author abstract modified)

1965

36117 **APTIC NO. 58635**

Byers, Horace Robert

NUCLEI IN THE ATMOSPHERE. *In: Elements of Cloud Physics. Chicago Univ. Press, 1965, Chapt. 4, p. 67-108. 123 refs.*

The development and composition of nuclei in the atmosphere is described. Particles capable of being condensation nuclei come from fine dusts eroded from the land by the wind, natural combustion and man made combustion, detachment from the sea surface by spray or bubbles, volcanic eruptions and man made explosions; extraterrestrial; and nucleogenic-chemical and photochemical reactions. The chemical composition reflects the source and the chemical processes in the atmosphere. Sulfates, chlorides, and nitrates are common, either in the acid form or with sodium, potassium, calcium, ammonium ions, and others. Sulfates are formed by combustion and other chemical processes, as also are nitrates. Chlorides come both from the sea and land. Ammonia is familiar in decaying organic matter. A number of complex oxidation processes occur. Ozone is formed in a photochemical oxidation process of hydrocarbons in the presence of nitrogen oxides. Fuels such as coal and oil contain appreciable amounts of sulfur which, upon combustion, produce sulfur dioxide. The SO2 is oxidized to sulfur trioxide in the atmosphere, and in the presence of water the SO3 immediately forms sulfuric acid particles.

36118 **APTIC NO. 58700**

Byers, Horace Robert

NUCLEATION PROCESSES. *In: Elements of Cloud Physics. Chicago, Chicago Univ. Press, 1965, Chapt. 3, p.39-66. 45 refs.*

Heterogeneous and homogeneous nucleation processes are described. When a suitable surface is present, nucleation will occur on it. The surfaces may be particles or larger surfaces of foreign substances or of the same substance. This nucleation is called heterogeneous. In the absence of suitable surfaces, the nucleation would have to take place on embryos made up of relatively compact collections of a few molecules of the substance. This nucleation is called homogeneous. Homogeneous nucleation of pure water vapor to droplets requires large supersaturations until the droplets have grown to sizes where the curvature effect is negligible. The problem of homogeneous nucleation of liquid droplets is treated analytically from the point of view of the probability of occurrence of embryos under different temperatures and supersaturations. A theory of heterogeneous ice nucleation on particles is formulated along the lines used in developing the theory of nucleation of liquid condensation on insoluble particles.

36119 **APTIC NO. 58705**

Byers, Horace Robert

CLOUD-DROPLET SPECTRA AND GROWTH BY COALESCENCE. *In: Elements of Cloud Physics, Chicago, Chicago Univ. Press, 1965, Chapt. 6, p. 141-172. 37 refs.*

The spectrum of cloud droplets and their growth by coalescence are reviewed. When rain is actually occurring the size distributions run from tiny cloud droplets to raindrops. The greatest interest is in those broad distributions within subprecipitating sizes because the possibility of collision coalescence as a rain initiating mechanism can be assessed. The most obvious case of collision and coalescence is that in which a raindrop or drizzle drop with an appreciable rate of fall collides with droplets of 5 to 10 micron radius which have terminal velocities one or two orders of magnitude slower, and may be considered as relatively stationary.

36120 **APTIC NO. 58706**

Byers, Horace Robert

THE INITIAL GROWTH OF DROPLETS AND ICE CRYSTALS IN CLOUDS. *In: Elements of Cloud Physics. Chicago, Chicago Univ. Press, 1965, Chapt. 5, p. 109-140. 65 refs.*

The initial growth of droplets and ice crystals in clouds is described. After a droplet or ice crystal nucleates and surpasses the free energy barrier or critical radius, it enters a stage of growth by diffusion of vapor to it. This growth is maintained as long as the saturation ratio or supersaturation required for its prevails. The growth by diffusion is extremely rapid at first, the droplet or crystal growing from the size of the nucleus to visible size in a fraction of a second, but soon slows down. The reverse process, evaporation or sublimation, is governed by the same laws of diffusion.

BASIC SCIENCE AND TECHNOLOGY

1974

36121 **APTIC NO. 58819**

Akimoto, Hajime

MECHANISM OF PHOTOOXIDATION OF HYDROCARBONS. *(Tankasuiso no kosanka hanno kiko). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(1):35-41, Jan. 1974. 12 refs.*

Hydrocarbon concentrations in the air of Tokyo are given. Aromatic HC from organic solvents used in industry and HC in automobile exhausts are compared. The ratio of saturated to aromatic HC is 4:1 in Los Angeles and 1:3 in Tokyo. Air pollution episodes due to aldehydes, nitrates, and peroxides are described. The reactivity of each HC in the photooxidation mechanism with nitric oxide, ethylene, and nitrogen dioxide is described. Computer simulations give good agreement with smog chamber data on photochemical reactions.

36122 **APTIC NO. 58320**

Bullin, Jerry A. and Abraham E. Dukler

STOCHASTIC MODELING OF TURBULENT DIFFUSION WITH HYBRID COMPUTER. *Environ. Sci. Technol., 8(2):156-165, Feb. 1974. 40 refs.*

The process of turbulent diffusion was modeled on a hybrid computer through the use of the generalized Langevin equation, and a form of this stochastic differential equation was developed to satisfy the general diffusion equation. All statistical terms in the equations were related to measurable Eulerian meteorological or fluid mechanical conditions, and time-varying fluctuating velocities were simulated using white noise generators filtered in a specified manner. The method was particularly easy to simulate on a modern hybrid computer, and the procedure was found to readily accommodate time-varying boundary conditions (inversion layers), initial conditions (source strength), and time and position-dependent flow conditions. Computer time was short compared to all known methods of solution of convective diffusion equations using finite difference methods; 24 hr of diffusion time in the atmosphere could be simulated in about 6 min of computer time. The method was tested by comparing calculated concentration distribution with data from experiments in boundary layers and in the atmosphere. Very good agreement was observed in all cases. (Author summary modified)

36123 **APTIC NO. 59305**

Clarke, Peter L. and James L. Wardell

GROUP IVB ORGANOMETALLIC SULPHIDES. PART V. REACTIONS OF LEAD SULPHIDES WITH SOME ELECTROPHILIC SPECIES AND MERCURY COMPOUNDS. COMPARISON OF THE REACTIONS OF ARYL TRIORGANOLEAD SULPHIDES WITH THOSE OF THE OTHER GROUP IVB SULPHIDES. *J. Chem. Soc., no. 2:190-194, 1974. 27 refs.*

The reactions of aryl triphenyl lead sulfides, Ph3PbSAr, with halogens, sulfur (II) halides, carbon halides, and mercury halides are reported. Unlike the analogous tin and germanium reactions, the reactions of organolead sulfides do not lead exclusively to cleavage of the metal-S bond. Ease of cleavage of the phenyl-Pb bond, decomposition of organolead (IV) compounds to inorganic lead (II) species, and photochemical reaction with solvents, such as carbon tetrachloride, all make the organolead sulfide reactions particularly complex. Similarities and differences in the reactions of R3MSAr compounds, where R is not H, Me is C. Si, Ge, Sn, and Pb are mentioned. Some bis (arylthio) Pb reactions are also reported. (Author abstract)

36124 **APTIC NO. 58850**

Cohen, N. S., R. W. Fleming, and R. L. Derr

ROLE OF BINDERS IN SOLID PROPELLANT COMBUSTION. *AIAA (Am. Inst. Aeron. Astronaut.), J., 12(2):212-218, Feb. 1974. 12 refs. (Presented at the American Institute of Aeronautics and Astronautics/Society of Automotive Engineers Joint Propulsion Specialists Conference, 8th, New Orleans, La., Nov. 29-1, 1972, Paper 72-1121.)*

A preliminary investigation into the effects of inert binder properties on composite solid propellant burning rate is described. Surface pyrolysis data were obtained for many polymers over a wide range of conditions, using a focused radiation source. These data were used to extract kinetics constants from Arrhenius plots, and heat of decomposition from an energy balance. Motion pictures were taken of the pyrolyzing surfaces, and gas samples were extracted for spectrometric analysis. Pyrolysis kinetics varied between the polymers, but were found to be independent of nitrogen pressure, the presence of ammonium perchlorate or catalysts in the sample, and their combinations. All of the polymers exhibited molten, boiling surfaces mingled with char, to varying degrees; the low activation energies measured may be associated with the boiling, or with a weak-link decomposition mechanism. Relevant data were input into the Derr-Beckstead- Price combustion model in order to associate binder properties with known effects on burning rate in simple propellants. Although the effects were predictable, they stemmed from properties other than pyrolysis kinetics. It appears that the role of binder lies in its contributions to controlling gas phase processes and not in surface pyrolysis properties. (Author abstract)

36125 **APTIC NO. 58475**

Davidson, George A. and David S. Scott

FINITE-AMPLITUDE WAVEFORMS IN AEROSOLS. *J. Aerosol Sci., 5(1):55-69, Jan. 1974. 13 refs.*

Stable and semi-stable waveforms in finite-amplitude wave propagation through monodisperse aerosols of spherical particulate matter are considered theoretically. For the case of a finite-amplitude step-wave, across-the-wave expressions for the six particulate and gas variables are rigorously derived; closed-form throughout-the-wave expressions are obtained for the gas and particulate velocities. The location of the particulate drag extremum behind the gas dynamic shock is given. The analytical results are used to show the existence of two essentially different dissipation mechanisms, each of which becomes dominant over a different part of the waveform. As such, a bimodal stability mechanism is suggested for both stable and semi-stable waveforms in aerosols. (Author abstract)

36126 **APTIC NO. 59316**

Dayan, Nissim and Isiah Gallily

A METHOD FOR THE PRODUCTION AND DETERMINATION OF THE CHARACTERISTICS OF WATER DROPLET AEROSOLS IN THE ABOVE-MICRON RANGE. *J. Appl. Meteorol., 13(1):78-86, Feb. 1974. 11 refs.*

A generator of water aerosols that produces almost uniform droplets in the above-micron range is described. The operational behavior and the effect of various parameters of the apparatus is reported. Attention is also paid to the rarely discussed electric charges of the particles, which can be neutralized at will. The size distribution of the droplets is determined both by a rate of fall and a light attenuation/weight method that check reasonably well; the number concentration is derived from the size distribution and the weight of the particles per unit volume while the charge is found from the mobility in a horizontal electric field. (Author abstract)

36127 **APTIC NO. 59307**

Deardorff, J. W.

DIFFERENCES BETWEEN EDDY COEFFICIENTS FOR INSTANTANEOUS AND CONTINUOUS VERTICAL DIFFUSION INTO THE NEUTRAL SURFACE LAYER. *Boundary-layer Meteorol., 5(4):451-457, Jan. 1974. 12 refs.*

Differences between eddy coefficents for instantaneous and continuous vertical diffusion into the neutral surface layer are calculated. Batchelor s similarity of law for vertical diffusion into the neutral surface layer was shown by Ellison to yield a universal constant equal to the Karman constant. However, the argument assumes that the eddy coefficient for mass above an instantaneous ground source is the same as for a continuous source. In this study, the former eddy coefficient is found to be time dependent and height independent if the particulate distribution is Gaussian. This leads to a value of the universal constant 2/pi smaller than found by Ellison. (Author abstract modified)

36128 **APTIC NO. 59083**

Denton, M. B. and D. B. Swartz

AN IMPROVED ULTRASONIC NEBULIZER SYSTEM FOR THE GENERATION OF HIGH DENSITY AEROSOL DISPERSIONS. *Rev Sci. Instr., 45(1):81-83, Jan. 1974. 16 refs.*

An ultrasonic nebulizer system capable of converting solutions into aerosols of various controlled droplet sizes with conversion rates in excess of 1 ml/min is described. This design allows generation of various sizes of droplets through overtone operation and simplified transducer substitution. The described irradiation cell is constructed from glass and fluorocarbon materials providing a high degree of chemical inertness. This aerosol generator can be used in research on atmospheric physics, medical therapy, cascade impactor calibration, flame spectroscopy, and other topics. (Author abstract modified)

36129 **APTIC NO. 58474**

Kirsch, A. A., I. B. Stechkina, and N. A. Fuchs

GAS FLOW IN AEROSOL FILTERS MADE OF POLYDISPERSE ULTRAFINE FIBRES. *J. Aerosol Sci., 5(1):39-45, Jan. 1974. 8 refs.*

The most efficient modern aerosol filters are made of ultrafine polydisperse glass fibers. Gas flow and pressure drop in these filters were measured at various pressure from 760 to 4 torr. A semiempirical formula was proposed and verified experimentally for the pressure drop as a function of the Knudsen number, packing density, and degree of structure nonuniformity of the filters. The polydispersity of fibers in a filter does not disturb the linear dependence of the pressure drop across a filter on the Knudsen number, in spite of the fact that the gas flow at the surface of thick and thin fiber is of a quite different character. Thus, the polydisperse filters can be described by a formula with the dependence of drag calculated by another formula and tau equals 1.4. (Author abstract modified)

36130 **APTIC NO. 58917**

Luria, Menachem, Rosa G. de Pena, Kenneth J. Olszyna, and Julian Heicklen

KINETICS OF PARTICLE GROWTH. III. PARTICLE FORMATION IN THE PHOTOLYSIS OF SULFUR DIOXIDE-ACETYLENE MIXTURES. *J. Phys. Chem., 78(4):325-335, Feb. 14, 1974. 25 refs.*

The kinetics of particle growth during the photolysis of sulfur dioxide with radiation greater than 3000 A in the presence of acetylene was studied at 29 C. Irradiation of the SO2-C2H2 mixtures resulted in production of carbon monoxide and an amorphous solid trimer of C3H4S2O3. Solid particles were formed after an induction period of about 45 sec and continued to grow and maintain a fairly uniform size. Particle number density slowly decreased until, after 1 or 2 hr of irradiation, a second nucleation occurred producing additional small particles. An interesting feature observed was the increase in the number density of small particles (greater than 25 A) after 60 min. The average number of trimers needed to produce a nucleus capable of growth was computed as 3.6, and the critical trimer concentration required for particle nucleation was 4.9 times 10 to the 10/cc. Every collision was effective for particles less than 200 A in diameter.

36131 **APTIC NO. 59334**

MacKinnon, D. J.

NITRIC OXIDE FORMATION AT HIGH TEMPERATURES. *J. Air Pollution Control Assoc., 24(3):237-239, March 1974. 4 refs.*

The amount of nitric oxide formed from various mixtures of nitrogen and oxygen has been measured by means of MS-10 mass spectrometer as a function of the temperature, residence time at temperature, percent N2 and percent O2 of gas mixtures. There is a peak temperature for NO formation and near this temperature NO formation reaches a maximum at a residence time of 5 sec. The formation of NO is directly dependent on percent N2 to the first power and on percent O2 to the one-half power. (Author abstract)

36132 **APTIC NO. 58811**

Nakano, K.

REACTION MECHANISM OF HYDROCARBON. *(Tanka suiso no hanno kiko). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(1):42-48, Jan. 1974. 9 refs.*

Photochemical reactions of hydrocarbons and nitrogen oxides are reviewed. The reaction mechanism for ozone production is discussed, including the reactions of oxygen atoms with molecules of oxygen and ethylene. The theory that the halogen produced by the photolysis of lead halide may contribute to the oxidation of nitric oxide and thus produce eye irritating substances is discussed. The mechanism of NO oxidation by HC is discussed in detail, and the importance of the hydroxide radical is emphasized. Photochemical reactivity of HC in increasing order is tetramethylethylene, trans-2-butene, trialkylbenzene, propylene, xylene, ethylene, toluene, and saturated HC. Eye irritation reactivity of HC in increasing order is aromatic olefins, butadiene, benzyls, terminal olefins, mutialkyl benzenes, internal olefins, benzene, and cyclic alkanes. Photochemical experiments using the ambient air in Los Angeles are mentioned.

36133 **APTIC NO. 58538**

Rastogi, R. P., H. J. Singh, and K. Kishore

STUDIES ON MIXED FUELS-HYDRAZINE AND ETHYL ALCOHOL SYSTEM. *AIAA (Am. Inst. Aeron. Astronaut.) J., 12(2):227-229, Feb. 1974. 8 refs.*

Physical properties and performance characteristics were determined for hydrazine-ethyl alcohol mixtures at a number of different mixture ratios. Mixed fuel containing 63% by weight hydrazine is stable in glass containers even for a year, whereas hydrazine as such decomposes appreciably in 10 days. The lower the hydrazine concentration, the greater the stability. The mixture was found to be a better fuel than pure hydrazine in that it has a lower surface tension, but was worse in terms of density and viscosity. Ignition delay is longer in the case of mixed fuel as compared to hydrazine, and delay increases with increase of ethyl alcohol concentration. However, the delay can be reduced by the addition of hydrazinium nitrate. The qualitative analysis of gaseous combustion products indicated the presence of nitrous oxide, hydrazoic acid, ammonia, and nitrogen. When the mixed fuel is used the only additional product is aldehyde produced by the oxidation of alcohol. This means that during the combustion of mixed fuels simultaneous reactions take place the values of performance parameters show that specific impulse, chamber temperature, and characteristic velocity all decrease with decrease in hydrazine content. The storability of the mixed fuel increases with the decrease in the concentration of hydrazine. For practical purposes, optimization is found at 70-80% by weight hydrazine.

36134 **APTIC NO. 58480**

Scholz, P. D. and D. R. Barber

TIME BEHAVIOR OF THE COAGULATION RATE IN A HIGHLY DISPERSED AEROSOL WITH UNEQUAL SPECIES TEMPERATURES. *J. Colloid Interface Sci., 46(2):220-226, Feb. 1974. 10 refs.*

Kinetic theory was used to determine the time behavior of the coagulation rate (i.e., the collision rate density) in a highly dispersed aerocolloidal system containing two distinct monodisperse particle species with initially unequal species temperatures. The gas-particle interactions are characterized by a Maxwell molecule force law and the particle-particle interactions by hard sphere collisions. The coagulation rate behaves exponentially with time and has an initial value which reduces to known forms in special cases. The time constant for the coagulation rate is proportional to the gas number density divided by the aerosol particle mass and to the square root of the product of the Maxwell force constant and the molecular mass of the gas. (Author abstract)

36135 **APTIC NO. 58890**

Shlien, D. J. and S. Corrsin

A MEASUREMENT OF LAGRANGIAN VELOCITY AUTOCORRELATION IN APPROXIMATELY ISOTROPIC TURBULENCE. *J. Fluid Mech. (Cambridge), 62(2):255-271, 1974. 32 refs.*

Atmospheric turbulence disperses solid and fluid particles and measurement of this phenomenon is basic to heat and mass transport problems. Small particles can be used to calculate the Lagrangian velocity correlation from particle dispersion. The mean temperature profile behind a heating wire spanning an isotropic turbulence (approximately the probability density of the lateral displacement of a fluid particle) is Gaussian within the accuracy of measurement, supporting earlier results. The maximum scatter on a typical profile is less than 2% of the peak. The measured Lagrangian velocity microscale of time is much larger than the Eulerian microscale of the turbulent velocity observed in a frame moving with the mean flow. The stationary Lagrangian time integral scale is about 30% larger than that of the Eulerian correlation moving with the mean flow. The Lagrangian velocity correlation coefficient was calculated and compared with the simplest Eulerian velocity correlation in time, i.e., that moving with the mean flow. They are rather different in shape. A realistic assumption of self-preservation of the particle velocities are made to calculate the Lagrangian correlation coefficient. This assumption collapsed the data taken with the source at two different stages of decay, verifying the self preservation assumption. The recasting of the results into those for a (hypothetical) nondecaying isotropic turbulence should be useful for comparison with future theories; theories tend to be simpler for nondecaying isotropic turbulence. (Author conclusions modified)

36136 **APTIC NO. 58511**

Sternling, C. V. and J. O. L. Wendt

ON THE OXIDATION OF FUEL NITROGEN IN A DIFFUSION FLAME. *Am. Inst. Chem. Engrs. J., 20(1):81-87, Jan. 1974. 15 refs.*

The kinetic mechanisms of fuel nitrogen conversion to nitric oxide and nitrogen in a diffusion flame were investigated. A simple model of a diffusion flame in which the reaction zone has a finite thickness was developed. The purpose of this model was to allow the testing of complex kinetic mechanisms of pollutant formation under conditions where the fuel and oxidant feed rates are controlled by diffusion. A simple kinetic mechanism in which fuel nitrogen was simulated by nitrogen atoms showed the correct functional dependence of NO emissions on fuel nitrogen content. The model also predicts a significant effect of combustion intensity and temperature on fuel nitrogen conversion. For the hydrogen/air duffusion flame, the Zeldovich reaction mechanism could account for the production of N2 and NO. Nitric oxide formation from fuel nitrogen occured at a much lower temperature than was necessary for NO formation from N2 fixation. This agreed with field data showing that flue gas recirculation, which decreases the flame temperature, is not effective in eliminating nitrogen oxide emissions from fuel nitrogen. But the still significant effect of temperature substantiated the claim that flue gas recirculation can reduce, but not eliminate, fuel NO from combustion processes. (Author abstract modified)

36137 **APTIC NO. 59321**

Strickler, S. J., John P. Vikesland, and H. D. Bier

THREE(B)ONE-ONE(A)ONE TRANSITION OF SO2 GAS. II. RADIATIVE LIFETIME AND RADIATIONLESS PROCESSES. *J. Chem. Phys., 60(2):664-667, Jan. 15, 1974. 16 refs.*

A modification of the equation given by Strickler and Berg is derived for calculating from spectroscopic data the radiative lifetime of a molecule whose transition moment varies with configuration. Using this equation, the radiative rate constant of the 3B1 state of sulfur dioxide is calculated to 79 + or 5/sec. The decay rate of this state is reported as a function of pressure at 30 C. The rate constant for quenching by ground state SO2 is 4.52 + or 0.18 times 10 to the 8th l/mole sec. The decay rate extrapolated to zero pressure is 1.12 + or 0.20 times 1000/sec. Comparison with the radiative rate constant shows that only about 7% of the triplet molecules emit, and the rest undergo some pressure independent nonradiative process. (Author abstract)

36138 **APTIC NO. 58790**

Warsi, Z. U. A. and L. J. Mertaugh

ESTIMATION OF TURBULENT ENERGY DISSIPATION USING AVAILABLE TRANSFER THEORIES. *AIAA (Am. Inst. Aeron. Astronaut.) J., 12(2):237-239, Feb. 1974. 11 refs.*

The objective here is to evaluate previous formulations of the turbulent energy spectral density function, including variations on Pao s expression, in order to obtain the function that seems to provide the best fit with the available test data over the full range of Reynolds numbers. The criteria used to evaluate the validity of the various density functions are a combination of those used by other workers plus one additional consideration, i.e., that the resulting values of A(R) should approach a value of about 0.16 as the Reynolds number becomes very large. Based on the results so obtained, the use of Pao s density function provides the best overall match with the various forms of the available test data.

1973

36139 **APTIC NO. 59161**

Abe, Koichi

LASER EXCITED FLUORESCENCE SPECTRUM OF NITROGEN DIOXIDE. *J. Mol. Spectr., 48(2):395-408, Nov. 1973. 22 refs.*

The fluorescence of nitrogen dioxide excited by a single mode argon-ion laser was studied at a spectral resolution of 0.1/cm; the Stokes and anti-Stokes nu2 bands excited by the 5145 A line of an argon-ion laser were examined in detail. The vibrational and rotational constants of the ground electronic state agreed well with infrared results, thus supporting the assignments made. No information on the assignment of the vibrational state of the upper electronic state was obtained, although the absorption spectrum suggested that the excitation proceeds to a highly excited vibrational state. Assignments for the ground state are provided in tabular form. (Author abstract modified)

36140 **APTIC NO. 58712**

Bailey, Bruce S., E. J. Forster, and William E. Morris

ROAD RATING TRENDS OF UNITED STATES MOTOR CARS--A REVIEW OF RECENT CRC PROGRAMS. *Preprint, Society of Automotive Engineers, New York, 18p., 1973. 13 refs. (Presented at the Society of Automotive Engineers, International Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1973.)*

A review of the Coordinating Research Council road rating programs conducted between 1952 and 1971 indicates that equations based on Research Octane Number (RON) and are satisfactory for predicting the road octane number of gasolines. MON has become more important and RON less important in prediction equations. Variables such as percent aromatics, lead concentration, and Distribution Octane Number are not broadly significant and improve RON/MON equation predictions only in restricted applications. Car appreciation of low-sensitivity fuels has increased, while appreciation of high-sensitivity fuels has decreased. Variability of Road octane testing and predications have remained substantially constant over the past 20 years. Because of variability considerations, measurements of road versus laboratory octane relationships and estimates of car satisfaction are subject to significant errors. (Author abstract)

36141 **APTIC NO. 58671**

Bigley, H. A., Jr. and J. D. Benson

ORI IN 1971 MODEL CARS-WITH AND WITHOUT LEAD. *Preprint, Society of Automotive Engineers, New York, 17p., 1973. 5 refs. (Presented at the Society of Automotive Engineers, International Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1973.)*

The results of a program to compare the influence of unleaded and leaded gasolines on octane requirement increase (ORI) are presented. A total of 147 1971 model cars (47 pairs and 53 individual cars) were operated for 8000-20,000 mi. One car of each pair was run on unleaded fuel of 91-95 Research octane number (RON) and the other on a leaded fuel of similar quality. For paired cars, the average ORI was 5.8 RON for unleaded and 3.8 RON for leaded fuel cars. The ORI difference of 2.0 RON for paired cars was slightly less than the average ORI difference of 2.5 RON for all 75 unleaded and 48 leaded cars. In a supplemental program, results in 20 cars showed an average ORI difference of only 0.3 RON between unleaded and low-leaded fuel cars. (Author abstract)

36142 **APTIC NO. 58924**

Billingsley, Frank P., II

CALCULATION OF THE ABSOLUTE INFRARED INTENSITIES FOR THE 0-1, 0-2, and 1-2 VIBRATION-ROTATION TRANSITIONS IN THE GROUND STATE OF NO PLUS. *Chem. Phys. Letters (Amsterdam), 23(2):160-166, Nov. 15, 1973. 14 refs.*

The absolute infrared intensities of the 0-1, 0-2, and 1-2 vibration-rotation bands in the ground state of nitric oxide cation (NO plus 1) were calculated from first principles. The dipole moment function for the cation was determined in the region of the equilibrium internuclear separation by an accurate multi-configuration, self-consistent-field procedure; and dipole matrix elements over the vibration states were solved exactly via numerical techniques. The ratio of the calculated integrated absorption coefficients for the fundamental and first overtone (88.8/sq cm atm and 0.6/sq cm atm, respectively, at 273.16 K) was in reasonable agreement with an estimate based on observation of these bands in the nitric oxide cation species at high altitudes in the upper atmosphere. (Author abstract modified)

36143 **APTIC NO. 58529**

Bisal, Frederick

INITIATION OF MOVEMENT OF SOIL AGGREGATES. *Can. J. Soil Sci., 53(4):481-482, Nov. 1973. 13 refs.*

Bisal and Nielsen (1962) suggested that impulsive forces due to turbulent air flow caused soil aggregates to leave the surface in a vertical direction. An explanation of the physics and clarification of the terminology of Bisal and Nielsen s (1962) observation is provided here. The first problem is that when computing the effect of an impulsive force on an aggregate, all finite forces acting during the same interval of time may be neglected; and the second problem is that the total energy in the region of the motion of the aggregate remains constant. Consideration must be given to the existence of an impulsive force normal to a turbulent fluid flow line. The total pressure of the air, which is the barometric pressure or stagnation pressure, in the region where the aggregate is positioned (below and between nonerosive aggregates) will result in impulsive forces, which initiate movement. The effect of this impulse provides the momentum that the aggregate has when leaving the surface. This is the condition for initiation of movement into the airstream. Turbulence also causes momentary impulses that approach the weight of the aggregate resulting only in aggregate oscillation. The drag on the aggregate and its angle of repose are not necessary considerations in determining the initiation of a heterogeneous soil.

36144 **APTIC NO. 58477**

Cresci, Robert J.

POLYTECHNIC INSTITUTE OF NEW YORK ENVIRONMENTAL WIND TUNNEL. *J. Environ. Syst., 3(3):233-251, Winter 1973. 16 refs.*

The design, construction, and calibration of the Polytechnic Institute of New York environmental wind tunnel is described. The basic simulation requirements which led to the configuration and nominal test conditions are discussed. The tunnel is an open circuit, closed test section facility with the capability of simulating the atmospheric mean wind profile and density distribution to an altitude of 2000 ft. It has a test section of 4 by 5 by 20 ft and a nominal velocity range between 0.25 and 35 ft/sec. In the clean condition it can also be used for the more conventional testing of vehicle configurations. Several studies using the wind tunnel are described. One measured external wind loads on a building in lower Manhattan. (Author abstract modified)

36145 **APTIC NO. 59081**

Cumo, Maurizio, Giovanni Elvio Farello, Giuseppe Ferrari, and Giorgio Palazzi

ON TWO-PHASE HIGHLY DISPERSED FLOWS. *Termotecnica (Milan), 27(12):674-688, 1973. 9 refs. (Presented at the National ATI Annual Meeting, Naples, Italy, Sept. 1972.)*

Experimental research on highly dispersed two-phase liquid-vapor turbulent flows was performed employing freon 12 at different pressures up to the critical value. A visualization technique was used to study the droplets size distribution, their spatial concentration, and the relationships among the deduced law of distribution and the main thermohydraulic parameters for different thermohydraulic conditions (pressure, specific mass flow rate, and quality). Simple laws were deduced by which it is possible to determine, at least for some reference thermohydraulic situations, all the characteristics of the liquid dispersed phase. (Author abstract modified)

36146 **APTIC NO. 58484**

Daneshyar, H. and M. Watfa

PREDICTION OF NITRIC OXIDE (NO) CONCENTRATION IN SPARK-IGNITION ENGINES. *Combustion Flame, vol. 21:395-398, 1973. 11 refs.*

A synthesis program has been developed for predicting nitric oxide emissions from spark-ignition engines. The program calculates pressure and temperature variation with crank angle using two models: a fully mixed model where the burned mixture in the cylinder is homogeneous in temperature and in composition and an unmixed model where the burned mixture is split into small elements each of which has a different temperature and composition. Both the formation and decomposition are important kinetically. The theoretical model has no sudden change in the detailed chemical kinetics built into it, and the theoretical results are in good agreement with experimental results. The formation and decomposition reactions may not be of equal importance at peak NO concentration, as previously suggested, since the peak NO concentration for both theoretical cases occurred at the same air/fuel ratio.

36147 **APTIC NO. 58613**

Deitz, V. R. and J. L. Bitner

INTERACTION OF OZONE WITH ADSORBENT CHARCOALS. *Carbon, vol. 11:393-401, 1973. 15 refs.*

A kinetic study was made of the ozone-charcoal reaction at ambient temperature by two different experimental procedures. In one the reaction took place with a fixed initial dose of O3, in the other a constant input of O3 was used. The depletion of O3 was monitored by ultraviolet absorption, and the formation of carbon dioxide was measured in flow experiments by infrared absorption. The sum of CO2 and carbon monoxide, formed from the earliest stages of the reaction, was significantly retarded as the calculated monolaver of oxygen atoms was approached. The weight increases of charcoal were directly related to the depletion of O3 after corrections were made for the gasification reactions. One atom of O2 from the O3 molecule accounts for the mass balance in the overall ozone-charcoal reaction. No catalytic decomposition of O3 by the charcoal was indicated. A reaction mechanism is suggested that accounts for most of the observed behavior. Scanning electron micrographs are presented for an original and O3-treated coconut shell charcoal. (Author abstract modified)

36148 **APTIC NO. 59016**

Destombes, Jean-Luc and Claire Marliere

HERTZIAN SPECTROSCOPY. DETECTING PHOTOLYSIS-GENERATED FREE SO AND CS RADICALS BY HERTZIAN SPECTROSCOPY. *(Mise en evidence en spectroscopie hertienne des radicaux libres SO et CS produits par photolyse). Text in French. C. R. Acad. Sci. Paris Ser. B., vol. 277:B427-B429, Oct. 1973. 9 refs.*

The formation of free SO and CS radicals by photolysis due to irradiation at a wavelength of 2300-2800 A was detected in a low-pressure mixture of sulfur dixoide and carbon disulfide by hertzian spectroscopy, using high-sensitivity spectroscope with Stark effect, Zeeman effect, or double modulation. The same phenomenon was also observed during irradiation at a high-frequency of 2450 MHz. The photodissociation of SO2 and CS2 occurred at wavelengths under 2200. The SO radical was indirectly also observed during the photolysis of a CS2 nitrogen dioxide mixture.

36149 **APTIC NO. 58762**

Garvin, David (ed.)

CHEMICAL KINETICS DATA SURVEY IV. PRELIMINARY TABLES OF CHEMICAL DATA FOR MODELLING OF THE STRATOSPHERE (INTERIM REPORT). *National Bureau of Standards, Washington, D. C., Physical Chemistry Div., NBSIR 73-203, 96p., May 1973. 217 refs.*

Chemical kinetic and photochemical data for gas phase reactions pertinent to the chemistry of the stratosphere are presented in four tables. These tables give recommended values and also cite recent experimental work. They give data in the following subject areas: chemical reactions and photochemistry of neutral species, energy transfer reactions, high temperature air reactions, and ion-molecule reactions. (Author abstract)

36150 **APTIC NO. 58394**

Glebov, V. P.

INVESTIGATION OF THE FORMATION OF SULPHUR DIOXIDE WITH COMBUSTION OF LIQUID HIGH-SULPHUR-CONTENT FUEL IN A CYCLONE CHAMBER. *Therm. Eng. (English translation from Russian of: Teploenergetika, 20(1):51-54, Jan. 1973. 5 refs.*

The influence of flame temperature, furnace chamber load, and boundaries of the zone of reaction in which sulfur dioxide forms with addition of more air were examined in relation to the formation of SO2 during combustion of high-sulfur diesel oil in a cyclone chamber. Increase in SO2 content in the flue gases was found to be mainly due to an accompanying increase in temperature of the ceramic walls of the combustion chamber with increase in flame temperature which appreciably intensified the heterogeneous catalysis. Sulfur dioxide concentration increased irrespective of flame temperature with an increase in excess air, and formation of the main quantity of SO2 occurred after the zone of the visible flame. Hence, only the quantity of atomic oxygen which was higher than the stoichiometric quantity of atomic oxygen took part in the formation of SO2 in the flame. Variation in boiler load did not affect the amount of sulfur trioxide formed in the flame.

36151 **APTIC NO. 58525**

Gueguen, Henri, Annie Chakroun, Monique Margottin-Maclou, and Lucien Doyennette

VIBRATIONAL ENERGY TRANSFER BETWEEN 14N2O, EXCITED TO THE VIBRATION LEVEL (00 DEG 1) AND 15N14NO, 14N15NO AND 15N2O ISOTOPE MOLECULES. *(Transfers d energie vibrationnelle entre le protoxyde d azote 14N2O, excite sur le niveau de vibration (00 deg 1), et les molecules isotopiques 15N14NO, 14N15NO et 15N2O). Text in French. C.R. Acad. Sci. Paris, Ser. B., vol. 227:557-559, Nov. 1973. 5 refs.*

The vibrational energy transfer between nitrous oxide (14N2O), excited to the vibration level (00 deg 1) by a laser pulse and the isotopes 15N14NO, 14N15NO, or 15N2O in their binary systems was studied. The vibrational energy transfers provoked a rapid decrease in the intensity of the fluorescence emitted by the 14N2O molecules (00 deg 1 to 00 deg 0 transition), but also a simultaneous increase in the intensity of the fluorescence emitted by the 14N2O molecules in the warm bands. The decrease in the fluorescence intensity was determined to be an exponential function of time.

36152 **APTIC NO. 58663**

Hampson, R. F., D. Garvin, J. T. Herron, R. E. Huie, M. J. Kurylo, A. H. Laufer, H. Okabe, M. D. Scheer, and W. Tsang

PHOTOCHEMISTRY OF NO2. *In: Chemical Kinetics Data Survey VI. Photochemical and Rate Data for Twelve Gas Phase Reactions of Interest for Atmospheric Chemistry. National Bureau of Standards, Washington, D. C., Physical Chemistry Division, NBSIR 73-207, p. 59-78, Aug. 1973. 30 refs.*

The photochemistry of nitrogen dioxide was determined and interpreted. The primary photochemical process were discussed in various wavelength regions: lambda is less than 250 nm, 250 is less than lambda is less than 398 nm, and lambda is greater than 398 nm. The mechanisms that control the relative concentrations of NO2, nitric oxide, oxygen, and ozone in a polluted atmosphere are presented. The specific rate of photodissociation of NO2 to given O2 by absorption of solar radiation was determined. The reactions are controlled because they are much faster than any other reactions and involve these species in the polluted atmosphere. Stationary state concentration or intermediates were established.

36153 **APTIC NO. 58834**

Hikita, Tsuyoshi

COMBUSTION AND NOX. *(Nensho to NOx). Text in Japanese. Kankyo Sozo (Environ. Creation), 3(12):42-47, Dec. 1973. 7 refs.*

Reaction mechanisms of nitrogen oxides are reviewed. Decomposition, oxidation, and formation at high temperatures of nitric oxide are discussed. Control methods for NO and NOx are mentioned. Molecular nitrogen reacts with atomic oxygen to form NO and atomic nitrogen, which in turn reacts with molecular oxygen to form NO and O. The decomposition of NO occurs with the reaction of NO and N to give N2 and O. Nitric oxide also reacts with O and atomic hydrogen to give

O_2 and hydroxides. Most of the NO_x formed by combustion of fuels is NO. The amount of NO formed during combustion is decreased by lowering the concentration of O_2 and lowering the combustion temperature. Rapid cooling of the flame after combustion decreases the amount of NO emitted.

36154 **APTIC NO. 58352**

Hino, Mikio, Giichi Mori, and Shinjiro Yoshikawa

PREDICTION OF AIR POLLUTION BY KALMAN FILTERING. *(Karuman firuta ni yoru taiki osen yosoku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):402, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 140.)*

Air pollutant dispersion was studied by the Kalman filtering method, regarding the dispersion coefficient as an unknown linear constant differential coefficient. Time, concentration at monitoring points, wind velocity, and smoke emission quantity are known, but unknown system parameter vectors are analyzed by the Kalman gain formulas. Using the data in the Mizushima industrial area, measurements at four points, wind velocity and direction, and emission quantities, one hour, two hours, and three hours prior to measurements, were predicted. The predictions showed a very satisfactory agreements with the actual measurements.

36155 **APTIC NO. 58737**

Hoenig, Stuart A., Christian W. Savitz, Edwin M. Bebee, James E. Summerton, and Freedoon Tamjidi

NON-DESTRUCTIVE EVALUATION OF FATIGUE, GRINDING AND CATALYSIS BY MEANS OF EXOELECTRON EMISSION (APPENDIX B). *In: Detection Techniques for Tenuous Planetary Atmospheres. Arizona Univ., Tucson, Dept. of Electrical Engineering, Advanced Research Projects Agency and Air Force Materials Lab. Contract F33615-72- 6-1733, National Aeronautics and Space Administration Grant NGL-03-002-019, 61p., 1973. 8 refs.*

NTIS: N73 29869

Catalytic oxidation of carbon dioxide, ammonia, hydrogen and nitric oxide over platinum, palladium, or monel was examined. The rate of reaction could be observed and controlled in terms of the exoelectron emissions from the catalyst. These studies can be used in relation to automotive emission control and spacecraft atmospheric purification.

36156 **APTIC NO. 58351**

Ishimaru, Kunio, Ginshiro Oyama, and Akikuni Miyasaka

ON RELATION BETWEEN LIQUID PHASE AND GAS PHASE AMMONIUM CONTENT. *(Ammonia no yoeki nodo to kitai nodo no kankei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):357, 1973. (Presented at Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973. Paper 101.)*

The relationship between an ammonia solution concentration and gas concentration was studied, using an ammonia producer comprising a compressor, a gas meter, a soda lime container, a permanent temperature water tank with a producer jar, a trap jar, and absorption jars. By varying temperature, pH, and ammonia solution concentration, changes in the ratio of solution concentration to gas concentration were examined. By adjusting pH to greater values, gas formation increased, and when pH was less than 8, almost no ammonia gas was formed.

36157 **APTIC NO. 58947**

Jones, I. T. N. and Kyle D. Bayes

PHOTOLYSIS OF NITROGEN DIOXIDE. *J. Chem. Phys., 59(9):4836-4844, Nov. 1, 1973. 23 refs.*

Relative quantum yields for the photolysis of nitrogen dioxide to give nitric oxide were measured at 5 or 10 nm intervals in the range of 295-445 nm, as well as at several longer wavelengths. The behavior of the quantum yield as a function of photon energy was separable into three distinct wavelength regions. The quantum yield was almost constant and independent of NO_2 pressure in the range of 0.5-4 torr at all wavelengths shorter than 398 nm, and photodissociation probability of NO_2 remained close to unity for photolysis by all wavelengths shorter than the dissociation limit at 398 nm in comparison with previous work. There was a small quantum yield for NO formation which decreased slowly with increasing wavelength at wavelengths longer than 430 nm, and quenching studies and variations in light intensity showed that these small yields were caused by reaction of an electronically excited NO_2 molecule with ground state NO_2. The quantum yield fell abruptly in the wavelength region between 400 and 430 nm; isotopic exchange experiments involving oxygen-18 confirmed that free oxygen atoms were produced in this region, even though the energy of the photolyzing quantum was less than the NO_2 dissociation energy. Recent fluorescence yield measurements quantitatively complemented the present photodissociation quantum yields. A previously suggested model, in which the ground state rotational energy of NO_2 supplemented the photon energy, gave only fair agreement with the experimental quantum yields; although a slight reduction in the accepted value for the dissociation energy of NO_2 would appear to somwhat improve the agreement between theory and experiment. (Author abstract modified)

36158 **APTIC NO. 58846**

Kajiwara, Masao

NITROGEN CONTENT IN FUEL OILS -- METHODS OF ANALYSIS. *(Nenryo-yu chu no chissobun bunseki hoho). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(12):62-72, Dec. 1973. 52 refs.*

Methods for the quantitative determination of nitrogen in crude oils are reviewed. In the Dumas method the samples are heated in carbon dioxide gas in the presence of copper oxide. The nitrogen oxides thus formed are reduced to give nitrogen. The N_2 is put into an aqueous potassium hydroxide solution which absorbs the CO_2 and the volume of N_2 may be determined. In the Kjeldahl method, the N_2 compounds are converted to ammonia which is easily titrated. In the ter Meulen variation of the Kjeldahl method the samples are thermally decomposed before passing through a catalyst tower in which N_2 compounds are converted to ammonia by a nickel magnesia catalyst. Nitrogen in crude oils can be determined also by instruments such as gas chromatographs and coulometers. The accuracies and precisions of these methods are compared.

36159 **APTIC NO. 58927**

Kiang, C. S., D. Stauffer, V. A. Mohnen, J. Bricard, and D. Vigla

HETEROMOLECULAR NUCLEATION THEORY APPLIED TO GAS-TO-PARTICLE CONVERSION. *Atmos. Environ., 7(12):1279-1283, 1973. 5 refs.*

An attempt was made to explain gas to particle conversion with heteromolecular nucleation theory by applying the latter to a binary mixture of water-sulfuric acid and water-nitric acid in air. The resulting formation of critical sized clusters was calculated as a function of relativy humidities up to 99%. Data on the activity necessary to achieve a heteromolecular nucleation rate of 1/cu cm sec as a function of relative humidity indicated that the H_2SO_4 curve should be considered as a lower boundary condition for gas to particle conversion in the atmosphere while HNO_3, with its relatively high vapor pressure, should be considered as representing an upper limit to the conversion. (Author abstract modified)

36160 **APTIC NO. 58452**

Kurylo, Michael J.

KINETICS OF THE REACTIONS OH(UPSILON EQUALS 0) + NH3 YIELDS H2O + NH2 AND OH(UPSILON EQUALS 0) + O3 YIELDS HO2 + O2 AT 298 K. *Chem. Phys. Letters (Amsterdam), 23(4):467-471, Dec. 15, 1973. 31 refs.*

The gas phase hydroxyl radical kinetics of the reaction of OH radicals with both ammonia and ozone at 298 K were studied in a flash-photolysis resonance fluorescence apparatus. The values of the rate constants were 4.1 + or 0.6 times 10 to the -14 power and 6.5 + or - 1.0 times 10 to the -14 power in units of cu cm/molecule/sec for the reactions with NH3 and O3, respectively. The results are discussed in terms of understanding the dynamics of the perturbed stratosphere. (Author abstract modified)

36161 **APTIC NO. 59304**

Lifshitz, C. and R. Tassa

A STUDY OF THE REACTION O(-) + NO2 YIELDS O + NO2(-) IN A PULSED ION SOURCE. *Int. J. Mass Spectrom. Ion Phys., 12(3): 433-437, Dec. 1973. 12 refs.*

The charge transfer from oxygen(-) to nitrogen dioxide was studied in a pulsed ion source. The rate constant obtained for this reaction, k equals (1.25 + or 0.1) times 10 to the -9th power cu cm/molecule/sec, is in excellent agreement with previous results by the flowing afterglow method. (Author abstract)

36162 **APTIC NO. 58914**

Lund, Louis and Jack Rivers

IRREVERSIBLE VAPOR CONDENSATION. *J. Rech. Atmospheriques, 7(1):29-38, Jan.-March, 1973. 12 refs.*

A mathematical treatment of the problem of homogeneous nucleation and growth of droplets is presented in terms of irreversible thermodynamics. Pure fluctuation effects are viewed as nonexistent, consistent with the basic ideas of thermodynamics, or else as averaged out and of no consequence in a macroscopic sense. The nucleation rate is determined for the known surface energy of a small droplet, and a nucleation rate law is determined without an explicit knowledge of the surface energy by supposing that the droplets form as initial clusters of two molecules and are free-growing thereafter. Those clusters which continually form and dissociate are taken into account a priori by the thermodynamic properties ascribed to the bulk vapor or liquid, thus permitting a unified treatment of embryo formation and growth up to the size where thermal and mass diffusion effects become important. The critical radius is used in the fluctuation theory of nucleation is not an essential concept in the treatment.

36163 **APTIC NO. 58950**

Lushnikov, A. A.

EVOLUTION OF COAGULATING SYSTEMS. *J. Colloid Interface Sci., 45(3):549-556, Dec. 1973. 10 refs.*

A simple transformation of the kinetic equation of coagulation is proposed based upon the general properties of solutions to the well-known Smoluchowski equation. New variables are introduced and expanded, and the expansion determines the behavior of the size distribution within the interval zero to less than infinity for dimensionless time. Simple recurrence relations are obtained for the determination of the coefficients of the expansion, and a scaling hypothesis adopted from the modern theory of second-order phase transitions is applied to establish the asymptotic form of size distributions at large values of monomers of coagulating particles and time. Three exactly soluble models are considered to demonstrate the application of the proposed method; and a number of consequences of the scaling theory are given by considering examples of Brownian coagulation in the continuum regime, Brownian coagulation in the free molecular regime, and coagulation by shear viscous flow.

36164 **APTIC NO. 58433**

Maksimov, B. G.

VOLATILITY AND ACTIVITY OF THE COMPONENTS OF THE N2O4 REVERSIBLY YIELDS 2NO2 SYSTEM ON THE SATURATION LINE. *(Letuchesti i aktivnosti komponentov sistemy N2O4 reversibly yields na linii rasyshcheniya). Text in Russian. Vestsi Akad. Navuk Belarusk SSR, Ser. Fiz.-Energ. Navuk, no. 3:117-123, 1973. 15 refs.*

The fugacity and the activity of the components nitrogen dioxide and dinitrogen tetraoxide on the saturation line from the triple point to the critical point were obtained using the experimental density of the system N2O4 reversibly yields 2NO2. The calculation results are presented on the fugacity coefficients of the pure components under the temperature and pressure of the mixture, on the fugacity coefficients of the components in the mixture, and the activity coefficients of the components in the saturation liquid and vapor phases.

36165 **APTIC NO. 59477**

Marzoch, D.

A COMPARISON BETWEEN MEASURED TRANSMISSION AND EMISSION SPECTRA AND CALCULATED SPECTRA IN THE 9.6 MICRON REGION OF OZONE. *(Ein Vergleich gemessener Transmissions- und Emisionsspektren mit berechneten Spektren in der 9.6 Bande des Ozens). Ludwig- Maximilians-Universitat, Munich (West Germany) Rept. MBFT-FBW- 73-01, 52p., Jan. 1973. Translated from German, Leo Kanner Associates, Redwood City, Calif., NASA TT F-15,110, 39p., Sept. 1973. 27 refs.*

NTIS: N73-31356

Measurements of the atmospheric transmission and emission in the 9.6 micron region of ozone were compared with the calculated spectra obtained from Clugh and Kneizys theoretical line parameters. The use of these line data recently fitted to laboratory measurements of McCaa and Shaw by Rest was found to lead to incorrect results. Spectra computed with the latest theoretical line data compared well with transmission measurements made from the ground, although comparison with infrared interferometer spectrometer data obtained from the Nimbus 3 satellite revealed a noticeable discrepancy. (Author abstract modified)

36166 **APTIC NO. 58438**

Matsuo, Yuzuru and Yasumasa Yamada

DETERMINATION OF SULFUR IN HEAVY OILS BY FLUORESCENT X-RAY. *(Keiko X-sen bunsekiho ni yoru juyuchu no io no sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):608, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 329.)*

In quantitating the sulfur content in fuel oil by x-ray analysis, a method of simplifying the process by dropping an oil and xylene mixtury (1:1 weight) on filter paper is reported. In order to shorten the preparation time further, oil was dissolved by a solvent and dropped on a filter paper. Three kinds of oil with different viscosities were tested. With fuel A, no solution was necessary, and dropping oil in helium rather than in vacuum was more effective. With fuel oils B and C, the ratio of dilution was tried from three to 21 times, and the dilution of 11 times by a lead naphtenate toluene solution was most effective and the best calibration line was obtained. This method requires no washing of the apparatus and takes only 5 min per sample, including the time of material preparation.

36167 APTIC NO. 58413

Matsushita, Hidetsuru, Michiko Koyano, and Keiichi Arashidani

A SIMPLE ANALYSIS FOR CARCINOGENIC HYDROCARBONS IN ENGINE OIL IN AUTOMOBILE. *(Shiyo shita jidosha enjin oiru-chu no hatsugansei tanka suisorui no kani bunseki-ho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):453, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 187.)*

Automobile engine oil is polluted by polynuclear aromatic hydrocarbons (PAH) from automotive engine exhaust, and by measuring the amount of PAH dissolved in the used oil, the total PAH emitted by the automobile during the life time of the oil can be calculated. An easy measuring method for PAH in the engine oil was devised. Used engine oil 0.5 g was taken and dissolved in 25 ml of cyclohexane, and 50 to 100 ml of the solution was painted over a two-layer plate; the plate was placed in a development tank; after development, the spots on the layer with acetyl cellulose layer were scraped and placed in the test tube with DMSO 3 ml and PAH was extracted. The extract was analyzed by fluorescent spectrometry. Nine kinds of hydrocarbons including benzo(a)pyrene were detected and errors were within 10%. In the old oil sampled from a gasoline stand, 3-6 ppm of benzo(a)pyrene were contained; the amount of carcinogenic hydrocarbons increased in the oil in proportion to the mileage.

36168 APTIC NO. 58674

McIver, Robert T., Jr. and Jeffrey H. Silvers

GAS-PHASE ACIDITY OF MONOSUBSTITUTED PHENOLS. *J. Am. Chem. Soc., vol. 95:8462-8464, 1973. 12 refs.*

The relative acidities of phenols substituted ortho, meta, and para with methyl, isopropyl, tert-butyl, fluoro, and chloro groups were determined in the gas phase by pulsed ion cyclotron resonance spectroscopy performed at very low pressures. Most species tested were more acidic than phenol itself with a surprisingly large magnitude of substituent effects. Gas-phase acidity correlates well with aqueous acidity for meta and para substituents, but not for ortho substituents. The data can be analyzed in terms of the effect of the substituent on the electron affinity of the substituted phenoxy radicals. The enhanced acidity produced by halogen substituents is best explained by a large electron withdrawing inductive effect which provides internal stabilization for the halophenoxide ions. This effect is decreased somewhat for the ortho and para positions due most probably to electron-donating resonance forms involving the (p) orbitals of the halogens. Alkyl substituents can stabilize the phenoxide substrate by an ion-induced dipole polarization interaction which increases with the size of the alkyl group and its proximity to the negative charge on the oxygen.

36169 APTIC NO. 58411

Nagata, Katsuya and Masahiko Mochizuki

NOX FORMATION IN DIFFUSION FLAME (I)--INFLUENCE OF COMBUSTION CONDITIONS. *(Kakusan nensho ni okeru NOx no seisei ni kansuru kenkyu-NOx seisei ni oyobosu nensho joken no eikyo). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan) (Tokyo), 52(558):778-784, Oct. 1973. 2 refs.*

The influence of combustion conditions in the formation of thermal nitrogen oxides in diffusion flames was investigated using a small apparatus similar to an industrial combustion system burning gaseous fuel. The fundamental relation between NOx emission and excess air is a convex curve having an NOx peak at some excess air factor. This relation varies with the mixing property of fuel and air flow in the combustion chamber. Formation of NOx increases as combustion air temperature is estimated numerically through the kinetic consideration. The mixing of fuel and air impacts the NOx formation. As mixing is improved, NOx emission is initially reduced, followed by an increase. This is caused by the decrease of residence time of the combustion gas in the high temperature region.

36170 APTIC NO. 58412

Nagata, Katsuya and Nasahiko Mochizuki

NOX FORMATION IN DIFFUSION FLAME (II)--PROPERTIES OF SOME NOX CONTROL TECHNIQUES AND PREDICTION METHOD OF NOX FORMATION. *(Kakasan nensho ni okeru NOx no seisei ni kansuru kenkyu (II)- yokusei taisaku no moderuka jikken to NOx seisei katei no suisanho). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan) (Tokyo), 52(558):785-790, Oct. 1973. 3 refs.*

The effect of nitrogen oxides reduction techniques was investigated. Practical NOx formation rates were experimentally obtained and the NO2 formation process was calculated by applying this rate to temperature profiles of combustion gas. Carbon dioxide pre-mixing in the combustion air indicates higher NOx reduction than nitrogen or argon. Nitrogen pre-mixing is same to A in spite of lower combustion temperature, because N2 concentration is higher than A. The effect of two-stage combustion is greater as mixing improves. The calculated concentration using the Nox formation rate and temperature history diagram coincides with experimental data.

36171 APTIC NO. 58435

Nakadoi, Takashi and Shin Suzuki

MEASUREMENT OF RADIATION INDUSTRY OF SUNLIGHT AS KO-VALUE. *(Kd ka hyogen no taiyo ko shigaisen kyodo no sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):609, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 332.)*

The intensity of ultraviolet rays expressed by Kd value is important in determining the photochemical reaction mechanism or the characteristics of the smog chamber light source. A method for expressing ultraviolet intensity in the solar radiation by Kd was studied. By continuously sending nitrogen dioxide and nitrogen gas into a spherical pyrex flask and exposing it to the light, the speed of NO2 photodegradation was dynamically measured. The mathematical formula is presented. Actual measurement of the Kd on the top of a mountain (640 m high) and calculation measurements are compared.

36172 APTIC NO. 53832

Nakayama, M. and S. Toyama

FORMATION OF NOX IN LUMINOUS AND NON-LUMINOUS FLAME. *(Kien fukien nensho niokeru NOx no seisei). Text in Japanese. Preprint, Combustion Inst. (Japan), p. 119-122, 1973. 1 ref. (Presented at the Symposium on Combustion, 11th, Tokyo, Japan, Dec. 6-7, 1973, Paper 33.)*

Emission concentrations of nitrogen oxides, carbon monoxide, and hydrocarbons were measured in a luminous (yellow) flame and a nonluminous (blue) flame. The effect of air-fuel ratio and spray mean diameter (S. M. D.) on NOx formation was examined. The burner used makes such comparisons possible by keeping the air-fuel ratio constant without changing the S. M. D. or the air flow rate for atomization and combustion. At 80 mm from the nozzle, in the blue flame region, NOx increased several-fold from the concentration at 110 mm from the nozzle, the yellow flame region. At a constant air-fuel ratio NOx formation increased with increasing S. M. D. At a constant S. M. D. NOx concentrations were not affected by changes in the air-fuel ratio. The difference in NOx concentration at different flame types becomes larger when turbulence in the burner increases. At an S. M. D. less than 75, NOx concentrations were independent of air-fuel ratio and yellow and blue flames emitted similar amounts of NOx. At S. M. D. larger than 75, the blue flame emitted 1.2 to 1.5 times as much NOx per unit weight of fuel as the yellow flame.

36173 **APTIC NO. 58432**

Nesterenkoi, V. B., B. Ye. Tverkovkin, V. Yu. Petrovich, and S. A. Zubtsova

STUDY OF THE HEAT AND MASS TRANSFER OCCURRING DURING TURBULENT FLOW IN THE CHEMICALLY REACTING GAS N2O4. *(Issledovanie tepla i massoperenosa pri turbulentnom techenii v trube khimicheski reagiruyushchego gaza N2O4). Text in Russian. Vestsi Akad. Navuk Belarusk SSR, Ser. Fiz-Energ. Navuk, no. 3:95-102, 1973. 20 refs.*

Heat and mass transfer of the chemical reacting system dinitrogen tetraoxide reversibly yields 2 nitrogen dioxide and oxygen to fully developed turbulent flow was investigated. The problem was solved by a boundary layer. Boundary conditions, inlet temperature and compositions, and fully developed velocity profile are considered to be known. The first stage of reaction is equilibrium and second stage is nonequilibrium. The fields of temperature and compositions are found numerically. The results are compared with the chemical frozen case.

36174 **APTIC NO. 58764**

Okabe, H., D. Garvin, and R. Hampson

PHOTOCHEMISTRY OF NO. *In: Chemical Kinetics Data Survey VI. Photochemical and Rate Data for Twelve Gas Phase Reactions of Interest for Atmospheric Chemistry. National Bureau of Standards, Washington, D. C., Physical Chemistry Div., NBSIR 73-207, p. 33-54, Aug. 1973. 31 refs.*

The chemical kinetics on the photochemistry of nitric oxide are presented. Primary photochemical transitions include: dissociation and electronic energy levels of NO and transitions. The spectroscopy of NO absorption bands was studied in detail at lambda is less than 130 nm and banded absorption. The results of studies of the photochemistry of NO at photon energies less than and greater than the dissociation energy are summarized. A major fraction of the photodissociation occurs in the same wavelength region as that for the Schumann-Runge absorption bands of oxygen. A line by line analysis must be made to determine the overlap between the radiation transmitted through the S-R bands and the NO absorption lines. From this analysis the effective absorption by NO can be obtained.

36175 **APTIC NO. 58371**

Okita, Toshiichi and Toshiaki Fujii

INVESTIGATION ON OXIDATION OF ODOR - REACTION OF MERCAPTAN AND SULFIDE. *(Akushu busshitsu no sanka ni kansuru kenkyu--(1) Io kagobutsu no hanno ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):375, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 115.)*

The rates of dissipation and formation of methyl mercaptan, ethyl mercaptan, dimethyl sulfide, dimethyldisulfide in the air under ultraviolet irradiation were examined. Analysis was done by gas chromatography, D.M.C.S., and infrared spectrophotometry; The test gases were within 60-700 ppm, dusts were settling particles and converter bag filter dusts, the temperature was 15-80 C, and humidity was 0.8-30%. The ultraviolet lamp wavelength was 300- 400 nm with special rays at 370, 405, and 430 nm. The rate of sulfide dissipation by adsorption was tested in an environment of 50 mg of dust and 250-300 ppm of MeSH, at temperature 15 C and 60 C. Adsorption was gradual at 15 C; but in the environment of 60 C, adsorption occurred within one hour and maintained the same level of approximately 100 ppm up to 12 hours.

36176 **APTIC NO. 58977**

Partsef, D. P., L. S. Zolotarevskiy, and B. A. Revich

A FORMULA FOR CALCULATING AMBIENT AIR CONTAMINATION BY VEHICLE EXHAUST GASES. *(Kriterial naya formula dlya rascheta zagryazneniya atmosfernogo vozdukha vykhlopnymi gazami avtomobiley). Text in Russian. Gigiena i Sanit., no. 12: 105-107, 1973. 2 refs.*

A criterion formula for the calculation of the contamination of the ambient air by motor vehicle exhaust gases is presented. According to the formula, the degree of contamination is dependent on such factors as the mass and state of repair of the vehicle, the speed, the effective width of the street, the distance between two crossings, the molecular diffusion coefficient, the coefficient of the climatic air viscosity, Reynold s criterion, and the angle enclosed by the road axis with the wind direction.

36177 **APTIC NO. 58434**

Pozdnyakov, D. V. and V. N. Filimonov

INFRARED STUDY OF MOLECULAR COMPLEXES ARISING FROM ADSORPTION OF NO AND NO2 ON THE SURFACE OF OXIDES. *Advan. Mol. Relaxation Processes, 5(1/2/3):55-63, Oct. 1973. 28 refs.*

Infrared spectra of nitric oxide and nitrogen dioxide adsorbed on magnesium oxide, aluminum oxide, nickel oxide, and zirconium oxide were examined. The results indicated that some NO2 dissociates on the catalysts and that the adsorption of NO as well as NO2 leads to the formation of the nitrosonium ion and coordinated NO species on the surface of the oxides. Adsorption of NO2 produced coordinated nitrates, whereas NO gave rise mainly to surface nitro groups. (Author abstract modified)

36178 **APTIC NO. 58444**

Quarles, John

REGULATIONS OF FUELS AND FUEL ADDITIVES. PROPOSED TEST PROCEDURES. *Federal Register, 38(237):34126-34129, Dec. 11, 1973.*

Proposed test procedures for the regulations of lead and phosphorus content of gasoline are described. The test for the determination of phosphorus in gasoline was developed for the determination of phosphorus generally present as pentavalent phosphate esters of salts, or both, in gasoline. This method is applicable for the determination of phosphorus in the range from 0.0008 to 0.15 g P/U. S. gal, or 0.2 to 40 mg P/litre. The test for lead in gasoline by atomic absorption spectrometry covers the determination of the total lead content of gasoline within the concentration range of 0.010 to 0.01 g of Pb/U. S. gal. This method compensates for variations in gasoline composition and is independent of Pb alkyl type.

36179 **APTIC NO. 59209**

Randerson, Darryl and John S. Cornett

NUMERICAL PREDICTION OF THE MESOSCALE TRANSPORT OF ATMOSPHERIC EFFLUENTS: PHILOSOPHY AND MORPHOLOGY OF EXPERIMENTAL MODELS FOR PREDICTING THE WIND AND POTENTIAL RADIOLOGICAL FIELDS OVER THE NEVADA TEST SITE. *National Oceanic and Atmospheric Administration, Las Vegas, Nev., Environmental Research Labs., Atomic Energy Commission Contract SF 54-351, ARLV-351-28, 61p., May 1973. 48 refs.*

NTIS: ARLV-351-28

Two experimental numerical meteorological models are described and tentatively verified. One model predicts the mesoscale wind field over mountainous terrain and the other model forecasts the temporal and spatial changes in the airborne radioactivity field that might be associated with an accidental release of debris during nuclear testing on the Nevada Test Site. A mesoscale wind prediction model is derived from the assumption of the conservation of vertical wind shear for a time period of at least 6 hr over an area 160 by 160 n mi. This assumption is closely analogous to the conservation of horizontal vorticity. Verification of the wind-prediction model was accomplished through two different modes. In the single case used to verify the radiological forecasts, the model predicts the path of the debris cloud to be too far east by about 13 n mi, 2 hr after detonation, and by about 20 n mi, 3 hr after detonation. (Author abstract modified)

36180 **APTIC NO. 59154**

Rodygina, L. G.

PYROLYSIS OF ORGANIC COMPOUNDS IN A FLAME. *(Izucheniye protsessa piroliza organicheskikh soyedineniy v plameni). Text in Russian. Fizika Goreniya Vzryva, 9(6):912-913, 1973. 2 refs.*

The pyrolysis of methenamine (urotropin) and of equal ratios of methenamine with anthracene, fluorene, tolan, and stilbene in a diffuse flame was studied. The composition and the hydrogen carbon atom ratio of the pyrolysis products captured at 15 mm from the flame center were analyzed. The hydrogen, methane, ethane, carbon monoxide, and carbon dioxide concentrations, as well as the hydrogen-carbon atom ratio for the pyrolysis of methenamine alone were 11.2; 1.3; 0.1; 6.0, and 8.5% by volume, and 2.9, the pyrolysis temperature being 1120 C. The corresponding figures for the pyrolysis of 50% methenamine with 50% anthracene at 1040 C were 1.7; zero, zero, 3.8 and 8.9% by volume, as well as 3.5. An increase of the hydrogen-carbon atom ratio was observed for all mixtures. The quantity of carbon tetrachloride-soluble compounds was higher during the pyrolysis of 50% methenamine with 50% anthracene or fluorene than it was for methenamine with stilbene and tolan. The differences in the composition of the pyrolysis products and of their hydrogen-carbon ratio is due to such in the structure of these compounds.

36181 **APTIC NO. 59467**

Spencer, F. E., Jr. and A. A. Orning

AN ALGORITHM FOR CALCULATING MULTIPHASE CHEMICAL EQUILIBRIUM. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Energy Research Center, RI 7786, 44p., 1973. 12 refs.*

An algorithm for computer program calculation of multiphase chemical equilibrium is described. The program was developed particularly for the purpose of studying problems in coal combustion, although the program s generality will allow its application to any equilibrium system in which an appreciable gas phase is present. Its application to coal combustion problems permits the prediction of composition and quantity of slag and unconsumed carbon phases as well as the calculation of gas phase composition, including trace species such as free electrons. The program has also been used in studying certain aspects of sulfur oxide control and coal gasification. (Author abstract modified)

36182 **APTIC NO. 58384**

Tillery, M. I., O. R. Moss, H. J. Ettinger, and G. W. Royer

EFFECT OF HUMIDITY ON THE AERODYNAMIC SIZE CHARACTERISTICS OF NONHYGROSCOPIC AEROSOLS. *Am. Ind. Hyg. Assoc. J., 34(10): 440-449, Oct. 1973. 26 refs.*

The effect of humidity on the aerodynamic size characteristics of nonhygroscopic aerosols was investigated in a series of experiments using iron oxide and Polystyrene Latex (PSL) aerosols. The LASL Spiral Centrifuge Aerosol Spectrometer and a horizontal elutriator were used to measure the differences in aerodynamic size (Dae). Under constant temperature conditions there is no change in Dae for particles as small as 0.312 micron with relative humidities as high as 97%. However, the combination of slight temperature decreases and a humid environment leads to signficant changes in Dae. (Author abstract modified)

36183 **APTIC NO. 59158**

Trubnikov, D. N., V. G. Samoilovich, and Yu. V. Filippov

THE THERMAL DECOMPOSITION OF OZONE IN LOW CONCENTRATIONS. *(Termicheskoye razlozheniye ozona malykh kontsentratsiy). Text in Russian. Vestn. Mosk. Univ., no. 6:634-638, 1973. 4 refs.*

The thermal decomposition of 0.001-1% by volume concentrations of ozone was studied in a temperature range of 100-200 C under atmospheric pressure. Both the activation energy and the order of reaction were found to be dependent of the O3 concentration. The reaction of secondary order for O3 concentrations of 1-0.1% by volume and the first-order reaction for concentrations of 0.01-0.001% by volume are determined. The activation energies, determined for O3 concentrations of 0.01% and 0.001%, are 10.2 kcal/mol and 6.5 kcal/mol, respectively.

36184 **APTIC NO. 58750**

Tsang, W.

THE COMBINATION OF HO WITH NO2. *In: Chemical Kinetics Data Survey VI. Photochemical and Rate Data for Twelve Gas Phase Reactions of Interest for Atmospheric Chemistry. National Bureau of Standards, Washington, D. C., Physical Chemistry Div., NBSIR 73-207, p. 21-32, Aug. 1973. 16 refs.*

The chemical kinetics of the combination of HO with nitrogen dioxide were determined. The fit of the data is based on RRKM calculations (o,p), a loose complex, and overall rotations active. Tables are presented on a comparison between experimental and calculated values of k1, a comparison between experimental and calculated values for k2, and a summary of experimental data on third body effects.

36185 **APTIC NO. 58467**

Tuer, Thomas W. and George S. Springer

A TEST PRINCIPLE MONTE CARLO METHOD. *Comput. Fluids, 1(4):399-417, Dec. 1973. 19 refs.*

A Monte Carlo technique was developed suitable for investigating rarefied gas dynamics problems. The procedure is based on the test particle method. The discontinuous function frequently employed for describing the target molecules velocity distribution is replaced by a continuous analytical function, the form of which is prescribed prior to the calculations. This modification simplifies the calculations, reduces the computer storage requirements, and facilitates the application of the method to multi-dimensional problems. The accuracy and versatility of the technique were evaluated by obtaining solutions to several one dimensional problems for which other results exist. The sample problems include gas at equilibrium between parallel plates, gas between parallel plates at different temperatures, normal shock in a rarefied gas, spherical source flow, and cylindrical source flow. Typical computer storage requirements and running times for the sample problems are given. The storage of other Monte Carlo methods are also given. (Author abstract modified)

36186 **APTIC NO. 58391**

Vaidyanathan, Ayalur and Gordon R. Youngquist

SORPTION OF SULFUR DIOXIDE, HYDROGEN SULFIDE, AND NITROGEN DIOXIDE BY ION-EXCHANGE RESINS. *Ind. Eng. Chem. Prod. Res. Develop., 12(4):288-293, 1973. 15 refs.*

The sorption of sulfur dioxide, hydrogen sulfide, and nitrogen dioxide by various polymeric ion exchange resins was investigated in a batch system. Rate and equilibrium data were obtained and qualitatively analyzed for sorption of SO2 and H2S by MR ion exchange resins (Duolite A 6 and Amberlyst A 26. The nature of the uptake curves suggests that diffusion in these polymers is non-Fickian in nature. It appears that sorption is accompanied by swelling and stress relaxation in the matrix. Both of the ion exchange resins studies showed considerable equilibrium loading capacities, especially at elevated pressure, but the slow rate to equilibrium which takes as many as 8t10 days, renders these resins unimportant for any commercial use as adsorbents. The suitability of the MR ion exchange resins for the removal of NO2 was also investigated. Both rate and equilibrium loading characteristics were excellent, but the resins are characterized by poor desorption characteristics that suggest reaction with the matrix, possibly at the ion exchange sites. (Author conclusions modified)

36187 **APTIC NO. 59309**

Wayland, Bradford B. and Larry W. Olson

NITRIC OXIDE COMPLEXES OF IRON (II) AND IRON (III) PORPHYRINS. *Chem. Commun., no. 23:897-898, Dec. 1973. 10 refs.*

Nitric oxide complexes of iron (II) and iron (III) porphyrins were investigated. The reversible formation of a NO adduct with tetraphenylporphyriniron (III) (TPP) chloride formulated as (Fe2(TPP)Cl(-)NO(+)) is observed in toluene, but reductive nitrosylation to given Fe2(TPP). Nitric oxide occurs in the presence of a hydroxylic solvent, in reactions analogous to hemeprotein interactions with NO. (Author summary modified)

36188 **APTIC NO. 59001**

Weinberg, W. H.

A MODEL DESCRIPTION OF THE ADSORPTION AND DECOMPOSITION OF NITROUS OXIDE ON CLEAN AND CARBON COVERED PLATINUM SURFACES. *J. Catalysis, 28(3):459-470, March 1973. 15 refs.*

The bond energy bond order (BEBO) model of chemisorption was used in conjunction with absolute rate theory (ART) to describe the interaction of nitrous oxide with both clean and carbon-covered platinum surfaces. The BEBO model allowed an estimate of both activation energies and heats of adsorption and/or surface reactions to be made, and combination of the BEBO model with ART permitted absolute magnitudes of the rates of the various elementary surface reactions which occurred when N2O interacted with Pt to be calculated a priori. The rate calculations were made using the experimental conditions of West and Somorjai, viz., temperature equal to 1125 K and an impingement flux of approximately 10 to the 13th power molecules/sq cm sec. The model calculations indicated the following under the above conditions: platinum surfaces were rather inefficient at dissociating N2O (less than 1% of the incident N2O molecules were dissociated); the fractional coverages of adsorbed nitrogen and oxygen atoms were small, i.e., the clean Pt surface remained very nearly clean during the reaction; and the reaction of N2O with platinum carbide was a direct reaction to produce nitric oxide gas without complete energy accommodation of the NO at the surface, whereas the reaction of N2O with clean Pt had two components to produce NO gas (both a direct reaction of the N2O and the desorption of an adsorbed N atom and O atom). The theoretical and experimental results showed very good agreement, and the clear utility of the ART-BEBO model in describing numerous other elementary gas-surface reactions was indicated. (Author abstract modified)

36189 **APTIC NO. 58329**

Wendt, J. O. L. and C. V. Sternling

CATALYSIS OF SO2 OXIDATION BY NITROGEN OXIDES. *Combustion Flame, vol. 21:387-390, 1973. 5 refs.*

The mechanism whereby two moles of nitric oxide plus one mole of oxygen give two moles of nitrogen dioxide which then reacts with sulfur dioxide to form sulfur trioxide and nitric oxide was tested. It was consistent with the observation that at high concentrations of NO, sulfur dioxide oxidation is second order with respect to NO and has a low activation energy. The theory was tested against experimental data without invoking the common steady-state assumptions; the same was done for low concentrations of NO where NO plus O2 give NO3 which in turn reacts with SO2 to give SO3 and NO2. The tested model was then used to ascertain whether the above reactions significantly affect the amount of SO3 produced in commercial furnaces and sulfur plant incinerators. Such data can be predicted using a simplified mechanism and that the model demonstrates that NO/SO2 catalysis is likely to be important in commercial combustion units only when NO concentration is in the 1000 ppm range or higher.

36190 **APTIC NO. 58711**

Wu, T. and K. J. McAuly

PREDICTING DIESEL ENGINE PERFORMANCE AT VARIOUS AMBIENT CONDITIONS. *Preprint, Society of Automotive Engineers, New York, 20p., 1973. 12 refs. (Presented at the Society of Automotive Engineers International Automotive Congress, Detroit, Mich., Jan. 8-12, 1973.)*

A semirational method is developed for predicting diesel engine performance over a range of ambient conditions at constant fuel rate and engine speed. The basic assumptions, derivations, and fundamental approach have been presented to facilitate further development of this method by other investigations. It is a simple method with reasonbale accuracy, that is, + or 5% in power prediction within a temperature range of 40-120 F and altitude up to 10,000 ft. It gives insight into the interrelationships of operating parameters, ambient pressure and temperature, fuel temperature, and coolant temperature. It can be used to predict trends and operating limits of engines such as power output, exhaust temperature, turbospeed, and smoke level. It is applicable to naturally aspirated, turbocharged, or turbo-intercooled diesel engines. (Author conclusions)

1972

36191 **APTIC NO. 59215**

Boehme, G., E. Robens, H. Straubel, and G. Walter

DETERMINATION OF RELATIVE WEIGHT CHANGES OF ELECTROSTATICALLY SUSPENDED PARTICLES IN THE SUB-MICROGRAMME RANGE. *Preprint, 13p., 1972. 7 refs. (Presented at the Conference on Vacuum Microbalance Techniques, 10th, Uxbridge, England, July 10-12, 1972.)*

NTIS: N72-33451

Electrically charged particles with masses in the nano and picogram range were suspended electrostatically in the inhomogeneous alternating field of a three-plate capacitor. The alternating field keeps the particles in a stable position in the bore-hole of the intermediate electrode; a constant field between the two outer electrodes may be applied to counterbalance the weight of the particles. Relative mass changes due to the sorption of vapors were determined from the onset of the oscillation caused when the stabilizing a.c. voltage was raised. In this way weight changes of less than 1 pg were observed. The experiments were performed to determine whether this method can be used for gravimetric analyses of the reaction kinetics between gases and solids. In addition, the experiments were performed to investigate the potential applications, the measuring range, and the sensitivity of the method. The method extends the gravimetric technique into the picogram range. It can be used to analyze reactions of particulate matter with a gas under conditions similar to those in practice. (Author abstract modified)

36192 **APTIC NO. 59026**

Carmichael, P. J., B. G. Gowenlock, and C. A. F. Johnson

MECHANISM OF THE REACTION OF NITROGEN DIOXIDE WITH 2-METHYL-2- NITROSOPROPANE. *J. Chem. Soc., no. 10:1379-1380, 1972. 4 refs.*

A mass spectrometric and isotopic labelling technique was used to show the reaction Bu(t)nitric oxide + nitrogen dioxide yields $\mathrm{Bu(t)NO_2}$ + NO occurs via an oxygen-atom transfer, and not by a displacement mechanism, where Bu(t)NO stands for trans-dimeric 2-methyl-2-nitrosopropane and $\mathrm{Bu(t)NO_2}$ stands for 2-methyl-2-nitropropane. (Author abstract modified)

36193 **APTIC NO. 59195**

Cudnick, R. A. and H. R. Velkoff

A STUDY OF CHARGED PARTICLE MOTION IN A FREE VORTEX FLOWFIELD. *Ohio State Univ. Research Foundation, Columbus, Ohio, Air Force Contract DA-31-124-ARO-D-246, Proj. No. s 20010501B700, 1D12140A142, Interim - TR-12, 134p., July 1972. 49 refs.*

NTIS, DDC: AD 749285

A study was made of charged particle motion in a free-vortex flow field to determine the parameters affecting particle motion and the extent of which applied electric fields can influence the particle motion. Four different cases were investigated: the analysis of the motion of an uncharged particle in a free-vortex; analysis of the motion of a charged particle in a viscous medium under the influence of an applied electrostatic field; analysis of charged particle motion in a free-vortex under the influence of the applied electrostatic field, assuming the particle is first positively and then negatively charged; and analysis of the motion of two charged particles in a free-vortex, accounting for field effects due to particle charge. Radial particle migration was increased in all cases as the particle diameter and density and the free-vortex flow velocity were increased. Radial particle migration was enhanced if the particle was assumed to be positively charged and under the influence of the electrostatic field due to a positively charged line source. The electrostatic force tended to balance the centrifugal force and allow the particle to maintain an equilibrium radius if the particle was assumed to be negatively charged. The field effects due to the particle charges themselves were insufficient to affect particle motion in the two-particle system. (Author abstract modified)

36194 **APTIC NO. 58630**

Dietz, V. R. and J. L. Bitner

THE REACTION OF OZONE WITH ADSORBENT CHARCOAL. *Carbon, vol. 10:145-154, 1972. 15 refs.*

The progressive reaction of ozone and oxygen mixtures with charcoal at 26 C was studied to specified weight-gains and to different subsequent weight-losses when outgassed at various temperatures. This study was undertaken to determine the surface properties of several adsorbents after the oxygen content had been significantly modified by reaction with O_3 at room temperature and to deduce some structural features of the original charcoal. Although each ozone-treated adsorbent gave evidence of continuous decomposition when introduced into a vaccum adsorption apparatus, stability was obtained when the sample was cooled to 77.4 K. The degassing was associated with an inherent unstability of the O_3-product formed and not with desorbed gases. The products were characterized by very large decreases in the nitrogen adsorption at 77.4 K. Two explanations are examined to account for the adsorption behavior. First, the etching reactions that prevailed during the formation of the original carbon adsorbent can continue and lead to pore structures of greater diameters (and accordingly lesser specific surface area) than the original charcoal. Second, a blockage of the micropore openings to N_2 molecules can take place due to the chemisorption of O_2 at the critical openings of the porous carbon structure. A sequence of three reactions is suggested to explain both the weight changes upon O_3 treatment and the unique behavior of the N_2 adsorption isotherms determined at 77.4 K. (Author abstract modified)

36195 **APTIC NO. 59496**

Hammer, Hans and Hans-Werner Langensiepen

ON THE SIMULATION AND OPTIMIZATION OF THE CATALYTIC CONVERSION OF CARBON MONOXIDE TO METHANE IN A GAS-LIQUID REACTOR. *(Zur Simulation und Oprimierung der katalytischen Methanisierung von Kohlenmonoxid in einem Gas/Fluessigkeits-Reaktor). Text in German. Chem.-Ingr.-Tech., 44(11):712-716, 1972. 11 refs.*

The minimum necessary reactor height for a column-type bubble reactor with a suspended catalyst for the conversion of carbon monoxide to methane was determined on the basis of digital simulation with a macrokinetic model. Hydration in fused hard paraffin at 230-270 C with a nickel-magnesia catalyst were chosen for the macrokinetic model. The minimum necessary reactor height was a function of the catalyst concentration and of the gas flow rate. The model is not applicable to flow rates causing settling of the catalyst. The minimum reactor height was at gas flow rates ranging from 4 to 5 cm/sec. The value obtained for the minimum necessary reactor height is modified by the degree of activity of the catalyst. With decreasing catalytic activity, the minimum of the reactor height shifts towards lower gas flow rates.

36196 **APTIC NO. 59487**

Marenco, Alain

SIMULATION OF THE HOLD TIME OF SOLID POLLUTANTS IN THE TROPOSPHERE BY NUMERICAL MODEL. *(Etude par simulation sur modele numerique du temps de sejour des polluants solides dans la troposphere). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 10p. 19 refs. (May 3-5.)*

A numerical model for the calculation of the hold time of solid air pollutants in the troposphere as a function of vertical exchange processes, sedimentation, washout, and source altitude is described. The hold time of a particular solid pollutant in the troposphere is principally determined by the altitude at which it is emitted. The hold time in the troposphere increased with the source height, and decreased with increasing washout intensity. Pollutants emitted near ground level are eliminated from the atmosphere mainly by settling, and have a hold time of about 15 days in the troposphere. Pollutants emitted at high altitudes in the troposphere, or such coming from the stratosphere, are eliminated from the atmosphere chiefly by washout, and have a hold time of about 100 days. The pollutants emitted in the troposphere, including its lowest layer, can be traced for hold time investigation by means of 210 Pb, 210 Bi, and 210 Po isotopes, while 7Be is suitable for the investigation of pollutants emitted in the high troposphere.

36197 **APTIC NO. 59509**

Selamoglu, Suha

DETERMINATION OF THE ATMOSPHERIC TEMPERATURE DENSITY PROFILES FROM FREE DESCENT OR ASCENT OF A SPHERE OF CONSTANT VOLUME AND MASS. *North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Modeling, 3rd Meet., Paris, France, 1972, p. XIII-1-XIII-10. 3 refs. (Oct. 2-3.)*

A mathematical analysis is presented to demonstrate the possibility of determining the density, temperature, and pressure profiles of the atmosphere by means of the free motion of a constant volume, constant mass sphere. The density profile of the atmosphere may be related to the velocities which would be acquired by a spherical body in its free fall or ascent in the atmosphere; and, under reasonable assumptions, the information on one of them, e.g., density, may be sufficient to determine the others. The practicability of the method and the associated problems and difficulties, such as those due to vertical winds, need further study, however.

36198 **APTIC NO. 58767**

Spindt, R. S. and J. C. Mulac

GASOLINE COMPOSITION AND PHOTOCHEMICAL REACTIVITY. *Preprint, American Chemical Society, 25p., 1972. 12 refs. (Presented at the American Chemical Society, National Meeting, 163rd, Boston, Mass., April 10, 1972.)*

The relationship between gasoline composition and photochemical reactivity was investigated. Increasing gasoline aromatic concentration from that of present gasolines has very little effect on the production of oxidant provided that the relative distribution of aromatic type is not significantly changed. These changes might result in modest increases (10-20%) in peroxyacetyl nitrate production, another photochemical oxidants, and possible eye irritants. Gasoline aromatics, heavier than toluene, and olefins formed during combustion appear to be the major contributors to the photochemical reactivity of exhaust gas. The amount of olefins formed during the combustion process decreases as gasoline aromatics are substituted for saturated hydrocarbons. This tends to offset the effect of increased gasoline aromatics on photochemical reactivity. Toluene is an excellent blending agent for gasoline since it has a high octane number and is relatively inactive photochemically. (Author conclusions modified)

36199 **APTIC NO. 59039**

Turman, Bobby N. and Richard E. Perrault

APPLICATION OF RADIOGRAPHIC TECHNIQUES TO STUDIES OF PARTICLE LADEN FLOW. *Aerospace Research Labs., Wright-Patterson Air Force Base, Ohio, Energy Conversion Research Lab., Proj. 7116-00-03, DoD Element 61102F, DoD Sub-element 681308, Rept. ARL 72-0007, 47p., Jan. 1972. 17 refs.*

NTIS, DDC: AD 740940

The experimental absorption and procedures utilized to measure powder density in flowing systems (applicable to dust separation devices) via attenuation of x-radiation are described. The effect of x-ray intensity spectrum on the effective absorption coefficient of the powder is considered, and an error analysis is presented. Maximum and minimum density measurements for the experiment are calculated, and the value of powder density multiplied by absorption path length is given for the absorption experiment. The minimum value of this product which can be determined is 0.03 g/sq cm (for talc powder), while the maximum value is 9.0 g/sq cm. Radiographs, density contours, and radial density profiles from multicomponent vortex flow experiments are also presented. (Author abstract modified)

36200 **APTIC NO. 58769**

Veselov, V. V.

ON THE NATURE OF THE DEPENDENCE OF THE RATE OF ADSORPTION OF THE SOLUTION CONCENTRATION. *(O kharaktere zavisimosti skorosti adsorptsii ot kontsentratsii rastvora). Text in Russian. Zh. Fiz. Khim., 46(4):974-976, 1972. 8 refs.*

The nature of the dependence of the rate of adsorption of the concentration of the solution was investigated in a model study, assuming diffusion to take place in the field of action of the adsorption forces in the adsorption phase. Under such conditions, the concentration of the component to be adsorbed in liquid phase can be regarded as constant, with a jump in concentration occurring at the phase boundary. The simplified model of the adsorption system and the mass transfer equation obtained show that dependence of the mass transfer of the solution concentration resembles the equilibrium curve. This is valid for adsorbents with small pore diameters. An increase in the adsorption of one component resulted in an increase in the intensity of the mass transfer.

36201 **APTIC NO. 58716**

Wiesmann, U.

THE INFLUENCE OF THE CONCENTRATION OF STABLE SURFACE OXIDES ON THE INTENSITY OF CARBON BLACK OXIDATION BY OXYGEN - II. OXIDATION WITH VARYING CARBON BLACK SURFACE. *(Der einfluss der Konzentration stabiler Oberflaechenoxide aur die Intensitaet der Oxydation von Russ durch Sauerstoff--II. Oxydation bei Veraenderlicher Russoberflaeche). Text in German. Carbon, 10(3):293-303, June 1972. 12 refs.*

The oxidation of pure carbon and graphite was investigated. The surface area of a carbon black increased by a factor of 10 compared to the initial value, when oxidized in air to a burn-up of 35%. Since the formation of surface oxide could not keep up with this increase in surface area, the equilibrium of chemisorption was not attained. In the range of increaseing surface area, the intensity of carbon burn-up decreased, but remained constant beyong this. The activation energy increased from 20 to 35 kcal/mole in the first range. An attempt was made to show by an approximating calculation that these results are consistent with results obtained previously by investigation carbon blacks of constant surface area. (Author abstract modified)

1971

36202 **APTIC NO. 59448**

Andreyev, S. D., L. S. Ivlev, and Ye. L. Yanchenko

OPTICAL CHARACTERISTICS OF ATMOSPHERIC AEROSOLS IN THE NEAR INFRARED REGION OF THE SPECTRUM. *(Opticheskiye kharakteristiki atmosfernogo aerozolyz v blizhney Ik oblasti spektra). Probl. Fiz. Atm., no. 9:48-58, 1971. 19 refs. Translated from Russian, Leo Kanner Associates, 15p., July 1973. (U. S. Army Foreign Science and Technology Center, FSTC-HT-23-2478-72, SI-73-53-639.)*

NTIS: AD 764 135

The behavior of the aerosol attenuation coefficient in the near infrared region of the spectrum was investigated, and its relation to the conditions under which the experiment was carried out is discussed. The experimental results are compared to those obtained from models of atmospheric aerosols. The Junge distribution is a sufficiently good model which can be used to calculate the aerosol attenuation coefficient. For other values of a meteorological visibility range, the selection of the model depends on other meteorological factors. If the relative humidity values in the atmosphere are not high, the aerosol particles may be covered by a film of water or ice, which can be detected with the aid of optical measurements at various altitudes of the direct solar radiation in the three micron band. Water aerosols rise higher in summer than in the winter.

36203 **APTIC NO. 58639**

Baskakov, A. P., B. V. Berg, and P. V. Sadilov

INVESTIGATION OF HEAT TRANSFER IN A HIGH-TEMPERATURE FLUIDIZED BED. *High Temp. (English translation from Russian of: Teplofiz Vys. Temp.), 9(5):911-914, Sept.-Oct. 1971. 19 refs.*

Investigations were performed in a laboratory furnace on the coefficient of external heat transfer in a 1200 C fluidized bed burning natural gas. The heat transfer coefficient increased with rising thermocouple temperature, and at the end of the heating period the rise was very steep. This was attributed to an increased radiant heat transfer at high fluidized bed temperatures. The dependence of the coefficient of radiant heat transfer on surface temperature was described by a third order polynomial, and the rate of increase of the total heat transfer coefficient became faster with a rise in the pickup temperature. Thermal conductivity coefficients were calculated for the experimental composition of a nonequilibrium gas atmosphere at a fluidized bed temperature of 1200 C from the Lindsey-Bromley equation, and the increase in such coefficients with falling air consumption was nearly linear.

36204 **APTIC NO. 59173**

Ferrara, R. and G. Tonna

PRACTICAL QUESTIONS ON THE USE OF MIE CROSS SECTIONS FOR SPHERICAL PARTICLES. *(Questioni pratiche riguardanti l uso della sezione d urto di Mie per particelle sferiche.) Text in Italian. Atti Assoc. Geofisica Italiana, Naples, p. 727-738, April 1971. 5 refs.*

The Mie theory for spherical homogeneous and isotropic particles is described and critical list of the existing numerical tables of the Mie cross sections is presented. Analytical and interpolation methods for the extension of the tables, and the programs for direct computation of the Mie cross sections, are treated.

36205 **APTIC NO. 58675**

Fuks, N. A. and A. G. Sutugin

HIGHLY DISPERSED AEROSOLS. *(Vysokodispersnye Aerozoli). Fiz. Khim., 1969. Translated from Russian. Techtran Corp., 89p., June 22, 1971. 167 refs.*

NTIS: N72-13117

The processes of formation of highly dispersed aerosols (HDA) with particle dimensions less than 0.1 micron are reviewed, along with methods of generation and investigations of their physical properties, which differ radically from the properties of coarsely dispersed aerosols. Under the first topic are considered formation of condensation HDA, production of HDA by physical condensation of vapor, by chemical reactions in the gas phase, and production of dispersed HDA. Investigation methods include analysis in the suspended state and methods based on articulate sedimentation. Transfer processes in HDA, charge transfer, thermophoresis, diffusiophoresis, capillary effects, and structure of HDA particles are all analyzed mathematically.

36206 **APTIC NO. 58620**

McIver, Robert J., Jr. and John R. Eyler

ACCURATE RELATIVE ACIDITIES IN THE GAS PHASE. HYDROGEN SULFIDE AND HYDROGEN CYANIDE. *J. Am. Chem. Soc., vol. 93:6334-6335, 1971. 17 refs.*

The acid strength of molecules is often quite different in the gas phase than that observed in solution. The gas phase acidity of hydrogen sulfide and hydrogen cyanide were studied experimentally. The equilibrium constants for the H2S-HCN mixture were determined in several experiments. Using an average value for the constant of 9.5 + or 1.5 for one reaction, the value of the heat capacity for cyanide equal to 15.5 + or 1.3 kca./mol was calculated from existing data. This was in good agreement with that obtained from photoionization measurements. The ability to measure gas phase ionic equilibria shows great promise for the determination of accurate relative stabilities of positive and negative gaseous ions. The measurement of equilibrium constants for proton transfer reactions will permit establishment of an absolute gas phase acidity scale. Such a scale will allow determination or reconfirmation of many bond strengths and electron affinities.

36207 **APTIC NO. 58699**

Vasudevan, M. S. and R. E. W. Jansson

THE MEASUREMENT OF TURBULENCE BY THE DEFLECTION AND ATTENUATION OF CROSSED LASER BEAMS. *Inst. of Electrical Electronic Engineers and Inst. von Karman de Dynamique des Fluids, Rhode-Saint-Genese (Belgium), Instrum. Aerospace Simulation Fac., p. 168-172, 1971. 4 refs. (June 21-23.)*

The measurement of turbulence by the deflection and attenuation of crossed laser beams was investigated. An apparatus was built to detect both the x and y deflections of both beams as well as total transmitted beam intensity. This allows correlations of deflection signals (caused by fluctuating density gradients) to be made simultaneously with the more usual attenuation correlations. Since the six tracts of information are recorded and processed digitally, correlations can also be made between deflection signals (density gradient) and attenuation signals (number density of markers, generally thought to represent velocity fluctuations). Clean or seeded flows can be studied, allowing experiments to be performed upon damping of turbulence by particles and upon the transport of particles by a turbulent field. Results are presented of experiments performed on a 1 in. diameter subsonic air-air free jet, to validate the instrumentation. (Author abstract modified)

1970

36208 **APTIC NO. 59188**

Mohnen, V. A.

PRELIMINARY RESULTS ON THE FORMATION OF NEGATIVE SMALL IONS IN THE TROPOSPHERE. *J. Geophys. Res., 75(9):1717-1721, March 20, 1970. 10 refs.*

An attempt has been made to determine theoretically a reaction scheme to explain the formation of negative small ions in the troposphere and lower stratosphere. The terminal ions are hydrated O2 (-) and CO4 (-). The degree of hydration depends on temperature, and the mean number of water molecules attached to those ions is of the order of 3 or 4. As soon as the water vapor concentration is less than the concentration of carbon dioxide (above about 8 km), the terminal ion is hydrated CO4 (-). The reaction scheme is based on measured and reasonably estimated reaction rate constants determined by using the U. S. standard atmosphere for the neutral gas composition. It is possible that the terminal ions, as determined here, will react further with minute quantities of electronegative gases present in polluted atmospheres (not listed in the U. S. standard atmosphere). It is also possible that the formation of condensation embryos is initiated in the presence of these negative (as well as positive) small ions. (Author abstract modified)

1969

36209 **APTIC NO. 59216**

Fedoseyev, V. A.

EVAPORATION AND COMBUSTION OF THE AERODISPERSED SYSTEMS. *Fiz. Aerodispersnykh Sist., no. 1:86-100, 1969. Translated from Russian. Air Force Systems Command, Wright-Patterson AFB, Ohio, Foreign Technology Div. Translation Div., FTD-MT-24-1245-71, 19p., 1969.*

NTIS, DDC: AD 743749

The laws governing aerodispersion systems can be applied to clouds and fogs in nature, artificial waves of aerosols, dispersion of fuel in engines, and air pollution by dust and smoke. Evaporation and combustion of aerodispersed systems was studied in an experimental facility where the evaporation or combustion appear as a luminous trace to the observer. The facility can be used to determine such evaporation and combustion characteristics as the time and rate of evaporation or combustion of droplets and particles, the induction period of preignition processes, mass and heat transfer characteristics, the influence of the temperature of the medium on the combustion rate, the influence of a gas medium and of various additions to the air, the completeness of combustion and the physicochemical composition of the combustion products, the emission of individual particles and of particle groups, the influence of catalytic additions and impurities, and the combustion of aerosols.

36210 **APTIC NO. 58714**

Richardson, W. C. and D. W. Setser

THERMAL DECOMPOSITON OF HYDRAZOIC ACID AS A POSSIBLE SOURCE OF NH RADICALS. *Can. J. Chem. (Ottawa), 47(14):2725-2729, 1969. 9 refs.*

The thermal decomposition of hydrazoic acid in the presence of methane, ethane, and propane was investigated over the temperature range 285-470 C. The only products were nitrogen, ammonia, and polymers. Limited experiments were done with ethene as a substrate, and products were formed which correspond to reactions of N2 containing radicals with C2H4. The pyolysis of NH3 is not a good source of NH radicals due to heterogeneity and complex secondary reactions of radicals with NH3. (Author abstract modified)

36211 **APTIC NO. 58637**

Soo, S. L.

PIPE FLOW OF SUSPENSIONS. *Appl. Sci. Res., vol. 21:68-84, Aug. 1969. 16 refs.*

Fully developed pipe flow of a particulate suspension was defined by four dimensionless parameters of particle fluid interactions in addition to the Reynolds number. Effects accounted for include the Magnus effect due to fluid shear, electrostatic repulsion due to electric charges on the particles, and Brownian or turbulent diffusion. In the case of a laminar liquid-solid suspension, the electrostatic effect is negligible, but the shear effect is prominent. Solution of the basic equations gives the density distribution of particles with a peak at the center (Einstein, Jeffrey) or at other radii between the center and the pipe wall depending on the magnitudes of the various flow parameters. In the case of a turbulent gas-solid suspension, the Magnus effect is significant only within the thickness of the laminar sublayer. Charges induced on the particles by the impact of particles at the wall produce a higher density at the wall than at the center of the pipe. The velocity distribution of particles is characterized by a slip velocity at the wall and a lag in velocity in the core from the fluid phase. These results were verified by earlier measurements. (Author abstract modified)

1967

36212 **APTIC NO. 58721**

Cullis, C. F., R. M. Henson, and D. L. Trimm

THE REACTIVITY OF SULPHUR DIOXIDE TOWARDS OXYGENATED FREE RADICALS. *Combustion Flame, 11(2):150-154, April 1967. 10 refs.*

While it is known that oxygen reacts rapidly with sulfur dioxide even at low temperatures, little is known about SO2 oxidation by free radicals containing oxygen. In this study, measurements were made of the extent of SO2 oxidation in systems involving oxygen-containing radicals such as OH, HO2, and RO2. No oxidation was detected except when nitric oxide was also present or when ignition occurred. These results suggest that at temperatures up to 700 C the rate of reaction of SO2 with oxygen-containing radicals is negligible. Supplementary information concerning the competition of organic fuels and SO2 for free radicals was obtained by studying the explosion limits of different fuel plus SO2 plus O2 mixtures. Sulfur dioxide exerts an inhibiting influence on the explosive oxidation of organic fuels, and its effect is directly proportional to the number of C-C bonds in the fuel molecule.

36213 **APTIC NO. 59165**

Ham, D. O.

MOLECULAR COLLISIONS. *In: Quarterly Progress Report. Massachusetts Inst. of Tech., Cambridge, Research Lab. of Electronics, Joint Services Electronics Programs Contract DA 28-043-AMC-02536(E), Rept. 87, p. 1-3, Oct. 15, 1967. 2 refs.*

NTIS, DDC: AD 661448

Molecular beam scattering of sulfur dioxide, carbon dioxide, nitric oxide, and nitrogen dioxide was studied experimentally and related to the general field of chemical kinetics. Collision complexes were found with long liftimes compared with a rotation time of the complex. The inelasticity varied from approximately 20% to 50% of the initial relative kinetic energy, in the range of energy studied, and was linear with the relative kinetic energy, for the case of sulfur dioxide. The distribution of inelasticities was very broad, and vibrational excitation occurred with very small probability -- the inelasticity with all rotational excitation. The total cross section for formation of the complex was so small in the case of NO that no peak was observed. A peak was observed with CO2, but it was not as prominent as with SO2. The NO2 yielded further posibilities for comparison with theories because the reaction was known to occur in this case. Further experiments and quantitative evaluation and comparison of these results with theoretical predictions are in progress.

1960

36214 **APTIC NO. 58431**

Butt, Pervez K. and Bryan P. Levitt

PYROLYSIS OF NITROGEN DIOXIDE IN THE SHOCK TUBE. *J. Chem. Soc., Faraday Trans. 1, no. 11:1957-1960, 1973. 12 refs.*

The kinetics of the pyrolysis of nitrogen dioxide between 1500 and 2300 K were investigated. They involve the dissociation of nitrate in addition to steps proposed at lower and higher temperatures. The rate of NO2 + NO2 yields nitric oxide + NO3 is somewhat faster than expected by extrapolation from experiments near 600 K. (Author abstract modified)

EFFECTS-HUMAN HEALTH

1974

36215 **APTIC NO. 59313**

Aronow, Wilbert S, Edward A. Stemmer, and Michael W. Isbell

EFFECT OF CARBON MONOXIDE EXPOSURE ON INTERMITTENT CLAUDICATION. *Circulation, 49(3):415-417, March 1974. 5 refs.*

The effect of breathing 50 ppm carbon monoxide for 2 hr versus compressed, purified air for 2 hr on intermittent claudication (cardiovascular-induced lameness) was evaluated in 10 men during a double-blind study. The mean venous carboxyhemoglobin level insignificantly decreased from 1.12% to 0.90% after breathing compressed, purified air but significantly increased from 1.08% to 2.77% after breathing carbon monoxide. The mean exercise time until the onset of the intermittent claudication insignificantly increased from 169 to 173 sec after breathing compressed, purified air but significantly decreased from 174 to 144 sec after breathing carbon monoxide. Breathing 50 ppm of CO for two hrs significantly aggravated intermittent claudication of the calf or thigh due to angiographically documentated occlusive arterial disease. (Author abstract modified)

36216 **APTIC NO. 59357**

Atwal, Onkar S.

PARATHYROID GLAND CHANGES FOLLOWING OZONE INHALATION. A MORPHOLOGIC STUDY. *Arch. Environ. Health, 28(2):91-100, Feb. 1974. 48 refs.*

Histological and ultrastructural changes in the parathyroid glands of rabbits were studied after 4 to 8 hr of ozone inhalation at a dosage of 0.75 ppm. More frequent changes observed included production of large numbers of secretion granules;

hyperplasia of the chief cells; proliferation and hypertrophy of rough endoplasmic reticulum, free ribosomes, mitochondria, Golgi complex, and lipid bodies; and accumulation of secretion granules inside the vascular endothelium and the blood stream. Morphologic evidence presented indicates that O3 inhalation in rabbits profoundly influences the parathyroid gland. (Author abstract modified)

36217 **APTIC NO. 59382**

Austin, R. H., K. Beeson, L. Eisenstein, H. Frauenfelder, I. C. Gunsalus, and V. P. Marshall

ACTIVIATION ENERGY SPECTRUM OF A BIOMOLECULE: PHOTODISSOCIATION OF CARBONMONOXY MYOGLOBIN AT LOW TEMPERATURES. *Phys. Rev. Letters, 31(8):403-405, Feb. 25, 1974. 6 refs.*

Carbon monoxide bound to myoglobin is capable of photodissociation with high quantum yield. Photodissociation and subsequent rebonding of CO can be observed optically since the absorption spectra of CO-free and CO-bound ferrous heme proteins differ. Rebinding in the temperature range of 40-200 K appears to be described by the function H(t) equals (1 plus t/to) to the minus n power, where H(t) denotes the fraction of Mb molecules that have not rebound CO at the time (t) after the flash and where t(o) and n are temperature dependent parameters. This behavior is explainable by assuming the existence of an activation energy spectrum which may be due to the existence of myoglobin conformers. (Author abstract modified)

36218 **APTIC NO. 58393**

Brain, Joseph D. and Peter A. Valberg

MODELS OF LUNG RETENTION BASED ON ICRP TASK GROUP REPORT. *Arch. Environ. Health, 28(1):1-11, Jan. 1974. 13 refs.*

The model of lung deposition and clearance developed by a Task Group of the International Commission on Radiological Protection (ICRP) is summarized. Mathematical equations and FORTRAN IV programs were derived to calculate particle retention using a four-compartment lung model with specified clearance times form each compartment. Three exposure patterns were considered: continuous chronic, acute pulse, and 40-hour work week exposures. Particle concentrations in each compartment at any time and integrated exposure over any period were calculated for each pattern. Results show that changes in particle size and solubility can alter retention and integrated exposure in some compartments by orders of magnitude, even when identical masses of aerosol are inspired. Air quality standards must take size distribution and solubility of the particle into account. (Author abstract modified)

36219 **APTIC NO. 58456**

Fine, David H., Firooz Rufeh, David Lieb, and Samuel S. Epstein

A POSSIBLE NITROGEN OXIDE--NITROSAMINE--CANCER LINK. *Bull. Environ. Contamination Toxicol., 11(1):18-19, Jan. 1974. 6 refs.*

The nitrogen dioxide emission standards have been relaxed because of consideration of short-term effects. However, there is growing evidence that one long-term effect of nitrogen oxides is possibly the production of N-nitrosamines which may be a carcinogen causally related to human cancer. The conversion of NOx to N-nitrosamines could pose significant public health hazards in general and carcinogenic hazards in particulate. Although the NOx-nitrosamine-cancer link is speculative, it is consistent with all available current scientific knowledge.

36220 **APTIC NO. 58388**

Goldstein, Bernard D., Leslie Y. Lai, and Richard Cuzzi-Spada

POTENTIATION OF COMPLEMENT-DEPENDENT MEMBRANE DAMAGE BY OZONE. *Arch. Environ. Health, 28(1):40-42, Jan. 1974. 29 refs.*

The potentiation of complement-dependent membrane damage by ozone was investigated withhuman red blood cells (RBC). After exposure to 40 ppm O3 for 2 hr, erythrocytes from three normal subjects produced positive acid, sucrose, and insulin hemolysis tests. These changes were associated with a marked loss in AChE activity and lesser decreases in RBC membrane neuraminic acid levels. None of these findings appeared in non-ozonized control preparations. When non-ozonized RBCs from subjects two and three were incubated with neuraminidase, complement-dependent hemolysis was not observed until there was at least a 40% reduction in neuramic acid levels. The decline in neuraminic acid is not of sufficient magnitude solely to account for the altered sensitivity to complement. Ozone exposure may sensitize the lung to complement mediated antibody damage. (Author abstract modified)

36221 **APTIC NO. 59356**

Goldstein, Elliot, David Warshauer, William Lippert, and Brian Tarkington

OZONE AND NITROGEN DIOXIDE EXPOSURE. MURINE PULMONARY DEFENSE MECHANISMS. *Arch. Environ. Health, 28(2):85-90, Feb. 1974. 38 refs.*

Mice were exposed to atmospheres of ozone and nitrogen dioxide for 17 hr prior to, or 4 hr after, infection with aerosols of Staphylococcus aureus labeled with radioactive phosphorus in an effort to investigate the possible synergistic effect of these gases on pulmonary resistance to infection. Animals infected and then exposed to various oxidant combinations manifested bactericidal dysfunction only when the level of one of the pollutants approximated its individual threshold value. Similar results were obtained when mice were exposed to pollutants for 17 hr before infection. Hence, the pulmonary consequence of exposure to O3 and NO2 appears equivalent to the injury that would be expected from each individual oxidant. (Author abstract modified)

36222 **APTIC NO. 59338**

Grover, Philip L.

K-REGION EPOXIDES OF POLYCYCLIC HYDROCARBONS: FORMATION AND FURTHER METABOLISM BY RAT-LUNG PREPARATIONS. *Biochem. Pharmacol., vol. 23:333-343, 1974. 30 refs.*

Epoxides of 7-methylbenz(a)anthracene and of benzo(a)pyrene that have been identified as the K-region epoxides, 7-methylbenz(a)anthracene 5,6 oxide and benzo(a)pyrene 4,5 oxide, have been detected as microsomal metabolites using preparations from the lungs of rats that had been pretreated with the microsomal mixed function oxidase inducer, 3-methylcholanthrene. It was also possible, using lung microsomal preparations from uninduced animals, to deomonstrate the formation of an epoxide identified as the K-region derivative, benz(a)anthracene 5,6 oxide, as a microsomal metabolite of benz(a)anthracene. The K-region epoxides of 7-methylbenz(a)anthracene and of benzo(a)pyrene could not always be detected as metabolites when lung microsomal preparations from uninduced rats were used. The activities of two other enzymes present in pulmonary tissue fractions that are involved in the further metabolism of polycyclic hydrocarbon epoxides have also been measured and the values compared with those obtained with rat liver. When benz(a)anthracene 5,6-oxide was used as substrate, much lower levels of microsomal epoxide hydrase activity were found in lung than in liver, but soluble-supernatant fractions of rat lung appeared to possess higher levels of glutathione S-epoxide transferase activity than were present in rat liver. The significance of these results in relation to the metabolic activation of polycyclic hydrocarbons by epoxide formation and to the induction of tumors of the respiratory tract by members of this class of chemical carcinogen is discussed. (Author abstract)

36223 **APTIC NO. 58593**

Howe, G. Melvyn

DISEASE AND THE ENVIRONMENT IN BRITAIN. J. Roy. Coll. Physicians, 8(2):127-139, Jan. 1974. 17 refs. (Presented at the College Conference on Individual and Geographical Differences in Susceptibility to Disease and Response to Drugs, Norwich, England, Sept. 1973.)

Atmospheric pollution is a major hazard within the human environment. Sources of pollution include motor vehicles, railway trains, aircraft, domestic heating, chemical plants, fuel-burning factories and offices, refuse disposal, and thermoelectric generating stations. Though the effects of acute air pollution incidents have in the past been dramatic, it is the chronic effects that are probably more important. Relationships between bronchitis and air pollution, inhibition of enzyme activity and excessive amounts of atmospheric lead, hypertension and other cardiovascular diseases and airborne cadmium, and between asbestosis and mesotheliomata and the inhalation of asbestos have been demonstrated. There has been a marked decrease in the amount of smoke and sulfur dioxide pollution in Britain since the implementation of the Clean Air Act. It is hoped that the lower levels of urban air pollution will have a favorable influence on the incidence of bronchitis in Britain. Nevertheless, man continues to interfere with the atmosphere, particularly by emitting new chemicals, without striving to determine the real and lasting effects of such actions on his health.

36224 **APTIC NO. 58465**

Kraemer, A, Hj. Staudinger, and V. Ullrich

EFFECT OF N-HEXANE INHALATION ON THE MONOOXYGENASE SYSTEM IN MICE LIVER MICROSOMES. *Chem. Biol. Interactions (Amsterdam), 8(1):11-18, Jan. 1974. 15 refs.*

Mice were continuously exposed to an atmosphere containing 2.5-3% n-hexane over a period of 4 days. Liver growth was observed after 24 hr of exposure. The specific activities of cytochrome P450 and the cytochrome P450 reductase increased with a maxium after 38 hr. The cytochrome b5 levels in liver microsomes began to rise at the second day and continued to increase even after the fourth day. No strict correlation was observed between the cytochrome P450 content and the monooxygenation activity for cyclohexane. The pattern of hydroxylation products from n-hexane changed significantly upon pretreatment of the animals which suggested that a qualitative alteration in the cytochrome P450 species had occurred. (Author abstract)

36225 **APTIC NO. 59323**

Lebowitz, Michael D., Paul Bendheim, George Cristea, David Markovitz, John Misiaszek, Michael Staniec, and David Van Wyck

THE EFFECT OF AIR POLLUTION AND WEATHER OF LUNG FUNCTION IN EXERCISING CHILDREN AND ADOLESCENTS. *Am. Rev. Respirat. Disease, 109(2):262-273, Feb. 1974. 30 refs.*

Lung functions in children and adolescents were tested under conditions of exercise with exposures to pollution and high temperatures. Variables, such as time of day, smoking, and respiratory medical history, were controlled in the analysis. Exercise alone, in the absence of air pollution and high temperatures, did not influence lung function. Exposures to pollutants of either oxidant or reducing type and to high temperatures produced postexercise decreases in forced vital capacity and 1-second forced expiratory volume in children and adolescents. The decreases were related to the relative levels of pollution and temperature. Longitudinal studies and possibly controlled exposure experiments are needed to confirm and quantify the relationships found in this study. (Author abstract)

36226 **APTIC NO. 59326**

Miller, S. D. and A. Zarkower

EFFECTS OF CARBON DUST INHALATION ON THE CELL-MEDIATED IMMUNE RESPONSE IN MICE. *Infec. Immunity, 9(3):534-539, March 1974. 25 refs.*

The effects of carbon dust inhalation on the bone marrow-derived (B) and thymus-derived (T) lymphocyte populations of spleen and mediastinal lymph node (MLN) cultures were examined. The concanavalin A (Con A)-responsive cell population (T cells) in the spleen was depressed after 7 days of pre-exposure to carbon dust. However, this effect was transient, and after 14, 21, and 28 days of pre-exposure to carbon dust, the Con A-responsive cells exhibited a 30 to 40% enhancement over control group responses. Conversely, Con A-responsive cells in the pooled MLN cultures exhibited depression, ranging from 22 to 33% below control group values, after 7, 14, and 28 days of pre-exposure to carbon dust. The lipopolysaccharide (LPS)-responsive cell population (B cells) in the spleens of carbon-exposed mice did not differ significantly from control group values after all times of pre-exposure. The LPS-responsive cells in the MLN cultures exhibited enhancement, ranging from 49 to 74% above control values, after 14, 21, and 28 days of pre-exposure to carbon dust. The ability of carbon spleen cell cultures from carbon-exposed mice to undergo antigen induced blast transformation after sensitization with Mycobacterium tuberculosis H37Ra was also determined. Mice exposed to carbon dust inhalation 2 wk before and 3 wk after aerosol or subcutaneous immunization exhibited significantly enhanced ratios of transformation upon culture of their spleen lymphocytes with purified protein derivative of tuberculin. (Author abstract)

36227 **APTIC NO. 58462**

Niedermeier, William, James H. Griggs, and John Webb

MATRIX EFFECTS IN THE EMISSION SPECTROMETRIC ANALYSIS OF TRACE METALS IN BIOLOGICAL SPECIMENS. *Appl. Spectry, 28(1):1-4, Jan./Feb. 1974. 5 refs.*

The effect of metals in animal tissues in the mg% range on the spectrochemical determination of certain trace metals in a sodium chloride matrix was studied. Human tissues were analyzed for copper, aluminum, barium, manganese, nickel, cesium, tin, strontium, chromium, zinc, lead, molybdenum, and cadmium trace metals by an emission spectrometer. The presence of as little as 1 mg% of iron, magnesium, calcium, potassium, or phosphorus had a marked influence on the spectral response of the trace metals studied. Matrix effects in this medium did not appear to be concentration-dependent or additive. Unless the matrix compositions of standards and specimens are closely matched, serious analytical errors will result (Author abstract modified)

36228 **APTIC NO. 58527**

Nomiyama, Kazuo and Hiroko Nomiyama

RESPIRATORY RETENTION, UPTAKE, AND EXCRETION OF ORGANIC SOLVENTS IN MAN: BENZENE, TOLUENE, N-HEXANE, TRICHLOROETHYLENE, ACETONE, ETHYL ACETATE AND ETHYL ALCOHOL. *Int. Arch. Arbeitsmed., 32(1/2):75-83, 1974. 22 refs. (Presented at the International Congress on Occupational Health, 16th, Tokyo, Japan, Sept. 25, 1969.)*

Mechanisms of respiratory retention of organic solvents are discussed. Respiratory retention, uptake, and excretion were estimated separately in 66 men and women volunteer students exposed to benzene, toluene, n-hexane, trichloroethylene, acetone, ethyl acetate and ethyl alcohol. After 2-hour exposure, respiratory retention reached constant levels. These differed for each of the solvents tested. No sex difference in retention was observed. Respiratory excretion values differed as 100 X concentration in expired air immediately following breathing of solvent-free air/concentration of solvent in air breather during exposure. Men excreted more toluene and trichloroethylene than did women. Uptake varied 27 to 60%. (Author summary)

36229 **APTIC NO. 58535**

Nomiyama, Kazuo and Hiroko Nomiyama

RESPIRATORY ELIMINATION OF ORGANIC SOLVENTS IN MAN: BENZENE, TOLUENE, N-HEXANE, TRICHLOROETHYLENE, ACETONE, ETHYL ACETATE AND ETHYL ALCOHOL. *Int. Arch. Arbeitsmed., 32(1/2):85-91, 1974. 12 refs.*

Respiratory elimination of benzene, toluene, n-hexane, trichloroethylene, acetone, ethyl acetate and ethyl alcohol was studied after exposure of human volunteers to those solvents. Solvent concentration in expired air decreased rapidly with time after the cessation of exposure and the decrease was expressed as an equation. Ethyl acetate and ethyl alcohol in expired air decreased faster than did other organic solvents. The decrease was very slow in acetone. Large amounts of retained acetone, benzene, and n-hexane were eliminated through the lungs as unchanged solvents, while the amount of eliminated ethyl acetate was almost negligible. The ratio of respiratory elimination to the inhaled (environmental) organic solvent suggested that the determination of respiratory concentration is helpful for estimating environmental benzene, acetone, trichloroethylene, and toluene concentration. (Author summary)

36230 **APTIC NO. 59147**

Raven, P. B., B. L. Drinkwater, R. O. Ruhling, N. Bolduan, S. Taguchi, J. Gliner, and S. M. Horvath

EFFECT OF CARBON MONOXIDE AND PEROXYACETYL NITRATE ON MAN S MAXIMAL AEROBIC CAPACITY. *J. Appl. Physiol., 36(3):288-293, March 1974. 32 refs.*

The metabolic, temperature, and cardiorespiratory responses of 20 healthy males (10 smokers and 10 nonsmokers) were monitored while working to their maximum and breathing four different gas mixtures at 25 + or 0.5 C and relative humidity of 20 + or - 2%. The four gas mixtures were filtered air, 50 ppm carbon monoxide in filtered air, 0.27 ppm peroxyacetyl nitrate in filtered air (PAN), and a combination of all three mixtures (PANCO). There was no significant decrement in obtained maximum aerobic capacity for either group during exercise at any given pollutant gas mixture compared with the filtered air mixture. Some minor and transient alterations were found in the initial stages of work regarding ventilatory efficiency when breathing 50 ppm CO. Smokers had significantly higher resting carboxyhemoglobin levels than nonsmokers, 3.17 and 0.64%, respectively, which remained greater following exercise even when exposure gas mixtures were CO and PANCO. Increases in carboxyhemoglobin levels of smokers during the CO and PANCO exposures were observed. Nonsmokers had greater vital capacities and maximum breathing capacities than the smokers, yet there were no differences in obtained maximum aerobic capacity. Core temperature of the smokers was significantly lower than the nonsmokers throughout the exercise and during recovery except at maximum aerobic capacity. However, for both population groups, exposure to two pollutants both singly or in combination while exercising to maximum aerobic capacity produced only minor alterations in cardiorespiratory and temperature regulatory parameters. (Author abstract)

36231 **APTIC NO. 59349**

Secchi, Gian Carlo, Luigi Erba, and Giovanni Cambiaghi

DELTA-AMINOLEVULINIC ACID DEHYDRATASE ACTIVITY OF ERYTHROCYTES AND LIVER TISSUE IN MAN. RELATIONSHIP TO LEAD EXPOSURE. *Arch. Environ. Health, 28(3):130-132, March 1974. 13 refs.*

The delta-aminolevulinic acid dehydratase (ALAD) activity of erythrocytes and of liver tissue was studied via biopsy specimens from subjects not occupationally exposed to lead. A considerable heterogeneity in the levels of ALAD activity of erythrocytes and of blood Pb was confirmed in this group, an expression of the varying degree of absorption of Pb that occurs in each individual who is exposed through pollution of the atmosphere and food. A correlation was found between the values of erythrocyte ALAD activity and the values of ALAD activity liver tissue. (Author abstract modified)

36232 **APTIC NO. 59073**

Shugaev, V. A. and V. A. Belyaev

SKIN-RESORPTIVE EFFECT OF HYDROGEN FLUORIDE FUMES. *(Kozhno-rezorbtivnoye deistvie parov ftoristogo vodoroda). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 1:31-33, 1974. 9 refs.*

The repeat action of hydrogen fluoride in concentrations of 38.6 an/ 72 mg/cu m on the respiratory organs and skin of rats caused marked resorptive effects in both cases. Fluorine accumulated in the organism, and specific biochemical changes occurred in the carbohydrate, mineral metabolism, and the redox processes. The degree and nature of pathological alterations were similar in an isolated action of gaseous HF both via the skin and the organs of respiration. Possible penetration of fluorine into the organism in ionic form via the skin occurred.

36233 **APTIC NO. 59143**

Sirs, John A.

THE KINETICS OF THE REACTION OF CARBON MONOXIDE WITH FULLY OXYGENATED HAEMOGLOBIN IN SOLUTION AND ERYTHROCYTES. *J. Physiol. (London), 236(2):387-401, 1974. 16 refs.*

Spectrophotometric measurements, using rapid mixing and stopped flow techniques, were made of the rate at which carbon monoxide displaces oxygen from its combination with hemoglobin in human and sheep blood. In hemoglobin solutions, buffered at pH 7.2 and 9.1, the reaction proceeded by a unimolecular dissociation. In a Ringer-Locke solution, the reaction of oxyhemoglobin (HbO2) with CO was a two-stage process, with a transition from one form of oxyhemoglobin (Hb4O6) to another. An investigation of the reaction between CO and HbO2 in erythrocytes, suspended in Ringer-Locke solution, indicated that the rate was determined by the chemical reaction and that this also was a two-stage process. The transition was probably associated with the reaction of carbon dioxide with Hb4O6, following the dissociation from fully saturated oxyhemoglobin of an oxygen molecule. It altered the relative velocity constants of the reactions of O2 with CO with Hb4O6 by 100:1. The implications of these proposals of the equilibria of hemoglobin with CO and O2 are discussed. The difference between the sigmoid equilibria curves at high HbO2 and carboxyhemoglobin values can be explained as due to the different reaction pathways. (Author summary modified)

36234 **APTIC NO. 58645**

Somjen, G. G., S. P. Herman, R. Klein, P. E. Brubaker, W. H. Briner, J. K. Goodrich, M. R. Krigman, and J. K. Haseman

THE UPTAKE OF METHYL MERCURY (203 HG) IN DIFFERENT TISSUES RELATED TO ITS NEUROTOXIC EFFECTS. *Preprint, Duke Univ., Durham, N. C., Dept. of Physiology and Pharmacology, 31p., 1974 (?). 40 refs.*

Rats were treated for 1-4 wk with subcutaneous injections of methyl mercury hydroxide containing the radioactive isotope 203 Hg to determine its neurotoxic effects. Of parts of the nervous system, the spinal dorsal root ganglia contained the highest concentration of Hg, followed closely by the cerebral cortex and the cerebellum, then the subcortical part of the forebrain. Spinal cord, spinal roots, and peripheral nerves contained significantly less Hg than the sensory ganglia. There was no difference in the Hg content of dorsal and ventral roots. The Hg levels of non-neural tissues are also presented. On autoradiograms made of the animal tissues, there were more reduced grains of silver over gray matter than over white matter, more in neutrons than in glia, satellite or Schwann cells. The results are consistent with the theory that spinal ganglia are the primary targets of poisoning by methyl mercury, and that the sensory axons degenerate because their parent cell bodies are damaged. (Author abstract modified)

36235 **APTIC NO. 59250**

Stara, J. F., M. Moore, and R. Hinners

TOXICOLOGY OF ATMOSPHERIC POLLUTANTS ASSOCIATED WITH THE USE OF AUTOMOBILE CATALYTIC CONVERTERS. *In: Environmental Research In 1973. Annual Report. National Environmental Research Center, Cincinnati, Ohio. Environmental Protection Agency, Cincinnati, Ohio, Office of Research and Development and Environmental Protection Agency, Cincinnati, Ohio, Environmental Toxicology Research Lab., EPA-670/9-74-001, p. 96-99, Feb. 1974.*

Catalytic converters are being studied as controls for reducing gaseous emissions from automobiles to comply with the Clean Air Act. However, these catalytic converters may themselves be sources of further emissions, such as platinum and palladium compounds from the catalysts. Various catalysts were studied to determine the emission of potential toxic pollutants. The converters caused 2.5-3.0 times more particulate matter and increased sulfuric acid particulates. Experimental animals such as rats were exposed to platinum and palladium by oral and intratracheal administration, and the whole body retention times for these metals were determined. The lethal dose of palladium chloride was 5 mg/kg after intravenous dose, 70 mg/kg after peritoneal dose, and more than 200 mg/kg following oral administration. Platinum and palladium caused inhibition of certain enzymes, skin irritation, and neuro-toxic effects. However, in a series of tests of automotive emission studies with catalysts, no significant amounts of platinum or palladium were found in tissues of animals continuously exposed. The toxic effects from the reduced carbon monoxide and hydrocarbon levels were much less than those due to the exhaust emissions of an engine without the converter.

36236 **APTIC NO. 58387**

Theriault, Gilles P., John M. Peters, and Lawrence J. Fine

PULMONARY FUNCTION OF GRANITE SHED WORKERS OF VERMONT. *Arch. Environ. Health, 28(1):18-22, Jan. 1974. 27 refs.*

The effect of granite dust on pulmonary function was investigated with 792 active granite shed workers from Barre, Vt. From a complete occupational history and a comprehensive evaluation of the past and present environment, a total lifetime dust and quartz exposure for each worker was established. Granite dust and quartz caused a decrease in forced vital capacity, forced expiratory volume in one second, and total lung capacity, but not in residual volume. This decrease was estimated by multiple regression analysis at 2 ml/dust-year. A dose response for quartz and granite dust shows that the midpoint 50% is 32.5 dust-years for total dust and 35 quartz-years for free silica. Standards for exposure to both granite dust and quartz can be derived from the present data. (Author abstract modified)

36237 **APTIC NO. 58510**

Yuill, Calvin, H.

PHYSIOLOGICAL EFFECTS OF PRODUCTS OF COMBUSTION. *Am. Soc. Safety Engrs. J., 19(2):36-42, Feb. 1974. 22 refs.*

A majority of fire deaths and a larger number of fire injuries are caused by short-term exposures to toxic gases that accompany accidental fires rather than to external skin burns. Lethal levels for momentary exposure of heat, oxygen, carbon monoxide, and carbon dioxide are 300 F, 6.0, 1.28%, and 12.0% respectively. Smoke can cause panic and blocking of vision, but is not seriously toxic. Other combustion gases are sulfur dioxide, nitrogen dioxide, hydrogen chloride, hydrogen cyanide, phosgene, hydrocarbons, and aldehydes. Some of these combustion products have additive (synergistic) effects which can cause death. More information is needed on the toxicity of the various combustion products through animal and human experimentation. The effects of combustion products on fire victims has not been greatly studied since analytical methods are complicated and expensive and there has been little standardization in these methods. Direct-reading analytical equipment that can be used with strip chart recorders is available for many gases, but the cost of one analyzer and recorder may be in the vicinity of $5000. Industrial and governmental research is now being conducted in this area.

36238 **APTIC NO. 58528**

Zielhuis, R. L.

BIOLOGICAL QUALITY GUIDE FOR INORGANIC LEAD. *Int. Arch. Arbeitsmed., 32(1/2):103-127, 1974. 45 refs.*

The feasibility of using blood levels of lead and parameters of subclinical response for indirect estimation of total environmental exposure to lead has been studied. Target groups selected from the general population should include at least 50 subjects of the same sex, similar socio-cultural class, and narrow age range. The maximum acceptable individual level for adults is 40 micrograms Pb/100 ml blood. The distribution of levels of 98% of the target group should be taken as the parameter of external exposure. The distribution proposed as the biological quality guide is 98% less than or equal to 35 micrograms/100 ml, 90% less than or equal to 30 micrograms/100 ml, and 50% less than or equal to 20 micrograms/100 ml. If the general distribution of blood Pb levels in a target group exceeds the proposed guide, total exposure in the environment is too high and action should be undertaken directed at the total environment. If the distribution only exceeds the guide at high levels, a point source of external exposure is probable. (Author summary modified)

1973

36239 **APTIC NO. 59086**

Aparici, Pedro Carda

CARCINOGENIC FACTORS IN THE ENVIRONMENT. *(Factores carcinogenos en el medio ambiente.) Text in Spanish. Medicamenta, 61(508):133-142, Feb. 15, 1973.*

General problems of the presence of carcinogenic factors in the environment, as well as the mechanism of action of such carcinogenic factors as aflatoxins, nitrosamines, tobacco smoke, polycyclic aromatic hydrocarbons and other hydrocarbons, asbestos, metals, and radiation are surveyed. Cancers of the respiratory organs, especially of the lung and larynx, have experienced a spectucal increase during the past decades, which is mostly due to environmental and occupational factors, part from the increased use of tobacco. Chromium, nickel, asbestos, asphalt, arsenic, beryllium, mineral oils and their combustion products, such as polycyclic aromatic hydrocarbons, are carcinogenic. Beta-naphthylamine, pitch, coal-tar, anthracene, petroleum and its derivatives, as well as isopropylene, cause cancers of the respiratory organs and of the skin. Their target organs are the skin, nasal cavity, larynx, kidney, and the gall-bladder.

36240 **APTIC NO. 58465**

Aronow, Wilbert S.

SMOKING, CARBON MONOXIDE, AND CORONARY HEART DISEASE. *Circulation, 38(6):1169-1172, Dec. 1973. 23 refs.*

The relationship between smoking, carbon monoxide, and coronary heart disease is discussed. Evidence exists to indicate that cigarette smoking predisposes coronary heart disease, causes an increased mortality from coronary heart disease, and aggravates angina pectoris. Heavy atmospheric CO pollution clearly aggravates angina pectoris due to coronary heart disease. Transient peaks of up to 90 ppm CO were measured passing across the face of a person who sat next to a subject who was smoking a cigarette for 10 min in an exposure chamber. Restrictions on smoking in public places may be necessary to protect patients with coronary heart disease. There is a need for measures as mass transit systems, particularly in congested urban areas with heavy atmospheric pollution, smaller and less polluting cars, and restricted use of the automobile in urban areas to protect the welfare of the significant segment of the urban population who have coronary heart disease. (Author summary modified)

36241 **APTIC NO. 58540**

Ashcroft, T.

EPIDEMIOLOGICAL AND QUANTITATIVE RELATIONSHIPS BETWEEN MESOTHELIOMA AND ASBESTOS ON TYNESIDE. *J. Clin. Pathol., 26(11):832-840, 1973. 36 refs.*

Thirty-five necropsied cases of diffuse malignant mesothelioma of the pleura and six cases of mesothelioma of the peritoneum are reported. Occupational histories from 40 cases showed that 32 cases (80%) were definitely exposed to asbestos; six cases (15%) were probably exposed and two (5%) had no known exposure. The mean latent interval was 34 years. Occupational histories of 56 control patients matched in pairs for age and sex with 28 of the mesothelioma cases revealed definite exposure to asbestos in 12 controls (21%), probable exposure in 11 (20%), and no evidence of exposure in 33 (59%). The difference in incidence of exposure between mesotheliomas and controls is statistically highly significant. Six-micron histological sections of lung, available in 39 mesothelioma cases, contained coated asbestos fibers in 36 cases (92%). Sixteen cases of mesotheliomas showing fibers were free of asbestosis, asbestosis was slight in 14 cases, moderately severe in five cases, and severe in one case. The incidence of asbestos bodies in sections from mesothelioma cases were significantly higher than in a previously reported series of routine necropsies examined by lung smear. Counts of coated and uncoated asbestos fibers were performed on samples of lung tissue from 33 mesothelioma cases. No fibers were identified in one case and only occasional coated fibers in a second case. The remainder gave counts ranging from 154 thousand to 684 million fibers/g dry weight. Uncoated fibers were invariably present and usually comprised 50 to 80% of the count. No relationship was found between total fiber count and the latent period of the mesothelioma. The data suggest that, on Tyneside, exposure to asbestos sufficient to cause an appreciable risk of developing mesothelioma has usually occurred through occupational exposure rather than by general environmental pollution by asbestos. (Author abstract)

36242 **APTIC NO. 58463**

Baikov, B. K. and M. Kh. Khachaturyan

HYGIENIC ASSESSMENT OF THE REFLEX ACTION ON A BODY OF SMALL CONCENTRATIONS OF BUTYL ALCOHOL IN THE ATMOSPHERE. *(Gigiyenitseskaya otsenka reflektornogo deystviya na organizm malykh kontsentratsiy butilovgo spirta, postupayushchego v atmosfernyy vozdukh). Text in Russian. Gigiena i. Sanit., no. 12:7-11, 1973. 9 refs.*

The effect of butyl alcohol in the atmosphere on the light sensitivity of an eye adapted to darkness was studied. The reflex action of butyl alcohol was at a level of its threshold value of smell. The conditioned reflex and the encephalographic reactions changed under the action of sensory concentrations. On the basis of investigations performed, a maximum single time permissible concentration of butyl alcohol in the atmosphere was suggested of 0.1 mg/cu m.

36243 **APTIC NO. 59318**

Beasley, W. H., D. D. Jones, A. Megit, and Sylvia G. Lutkins

BLOOD LEAD LEVELS IN A WELSH RURAL COMMUNITY. *Brit. Med. J. (London), 4(5887):267-270, 1973. 26 refs.*

In a study of the blood lead levels of 626 healthy blood donors no differences were found between men and women, but there was a significant increase with age. Resident donors had a higher blood Pb than students, and the level in residents increased with living in the Aberystwyth area up to about 20 yr. The levels in the students did not increase with residence in Aberystwyth. No differences were found in the blood Pb of donors living in different wards of Aberystwyth and none between the blood Pb of donors living in the rural area and those in the town. Almost half of the local resident donors had a level above the normal range. (Author abstract)

36244 **APTIC NO. 58808**

Belobragina, G. V., Yu. M. Belyakov, G. P. Orlov, E. N. Pochashev, and L. A. Medvedev

STUDY OF THE CONTENT OF FREE RADICALS IN THE ANIMALS LUNGS IN AN EXPERIMENTAL PNEUMOCONIOSIS BY THE METHOD OF ELECTRONIC PARAMAGNETIC RESONANCE. *(Izuchenie soderzhaniya svodnykh radikalov v legkikh zhivotnykh pri eksperimental nykh pnevmokoniozakh metodom elektronnogo paramgnitnogo rezonansa). Text in Russian. Gigiena i Sanit., no. 12:37-40, 1973. 8 refs.*

An increase of the free radical content was noted in the lungs in cases of pronounced silicosis, pneumoconiosis from chamotte dust, asbestosis, and anthracosis, confirmed histologically and biochemically. This increase was most significant in silicosis and anthracosis. The erythrocytes presented a reverse process: the free radicals content was diminished and it was most distinct in cases of silicosis and anthracosis.

36245 **APTIC NO. 58335**

Biernat, Stanislaw and Zygmunt Zajac

PATHOMORPHOLOGIC CHANGES IN NASAL AND TRACHEAL MUCOSA OF GUINEA-PIGS DUE TO CHRONIC EXPOSURE TO COTTON DUST. *(Zmiany patomorfogiczne w blonie sluzowej nosa i tchawicy swinek morskich pod wplywem przewleklego dzialania pylu bawelnianego). Text in Polish. Med. Pracy (Warsaw), 24(1):53-58, 1973. 11 refs.*

Pathomorphologic changes in the mucosa of the nasal septum and trachea were examined in guinea pigs exposed to dust in cotton spinning mills over the period of 4 mo. The chronic mucitis was more marked in trachea than in the nasal septum. Changes in the upper respiratory tract due to cotton dust did not demonstrate any signs of allergy.

36246 **APTIC NO. 58797**

Bokina, A. I. and N. D. Eksler

ELECTROPHYSIOLOGICAL ANALYSIS OF THE ACTION OF CERTAIN ATMOSPHERIC POLLUTIONS ON THE CENTRAL NERVOUS SYSTEM. *(Elektrofiziologicheskiy analiz deystviya nekotorykh atmosfernykh zagryazniteley na tsentral nuyu nervnuyu sistemu). Text in Russian. Gigiena i Sanit., no. 12:11-16, 1973. 8 refs.*

Some common traits were found in the mechanism of action on the central nervous system of high concentrations of ozone and formaldehyde for a short time and that of low one for a long time. The most sensitive cerebral formations that were the first to take part in the pathological reaction with the toxic agents were the olfactory bulbs and the cortico-medial nucleus of the amygdaline complex. The noxious effect caused paroxysmal activity of specific olfactory structures and a prolonged generalized strain rhythm in the subcortical and neocortical structures.

36247 **APTIC NO. 59019**

Bompart, G., P. Bourbon, P. Levy, M. F. Bergeal, and P. Dorbes

THE EFFECT OF AIR POLLUTION ON ANIMALS. THE INFLUENCE OF SULFUR DIOXIDE ON THE FREE AMINO ACIDS IN THE RABBIT BLOOD PLASMA. *(Effet de la pollution de l air sur les animaux. Influence du dioxyde de soufre sur les acides amines libres du plasma de lapins). Text in French. Tribune CEBEDEAU (Centre Belge Etude Doc. Eaux), 26(360):447-458, Nov. 1973. 5 refs.*

The effect of different concentrations of sulfur dioxide on the free amino acid level in the blood plasma of rabbits exposed to 5 to 35 ppm concentrations of this gas one hour daily for 4 to 12 mo and for 3 yr was studied. Reduction of the total free amino acid levels in the blood plasma by 8 to 17% was observed in a group exposed to 35 ppm SO2 for 1 hr daily for 7 mo; in another group exposed to 5 ppm SO2 4 hr daily for 12 mo, and in rabbits having lived in a polluted industrial atmosphere for 3 yr. Decreases in the threonin, serin, cystin, cystein, ornithin, alanin and glutamin levels, and increase in the glutamic acid level were observed.

36248 **APTIC NO. 58822**

Bourbon, P., G. Bompart, P. Levy, and M.-F. Bergeal

THE ACTION OF SULFUR DIOXIDE ON SULFUR-CONTAINING FREE AMINO ACIDS IN THE BLOOD. *(Action du SO2 sur les acides amines soufres libres du sang). Text in French. J. Eur. Toxicol., 6(3):147-157, May-June 1973. 17 refs.*

The reactions of sulfites and sulfur dioxide with free blood sulfur-containing amino acids were investigated in vitro and in vivo. Under physiological conditions, sulfites introduced into the blood stream form compounds of S-sulfonate type with cystine and cysteine, probably through sulfitolysis of disulfide bonds. This reaction is quite transient, since the life-span of the compounds formed does not exceed 1 hr under these experimental conditions. This interaction may constitute a means of protection of the body against the aggressivity of high sulfur dioxide levels and facilitate the protracted exposure to low levels.

36249 **APTIC NO. 58543**

Burrell, Robert and Martha Anderson

THE INDUCTION OF FIBROGENESIS BY SILICA-TREATED ALVEOLAR MACROPHAGES. *Environ. Res., 6(4):389-394, 1973. 15 refs.*

An in vitro model for the study of the pathogenesis of silicosis was studied. In it, filtered supernates from alveolar macrophage cultures incubated in contact with silica particles were added to target cultures of lung fibroblasts. The effects of this system were easily studied by observation for cyctotoxicity and hydroxyproline production. The results confirmed and extended the observations of Heppleston and Styles and pointed to the use of such a system for the in vitro study of the effects of silica. Large concentrations of free silica particles had a slightly toxic effect on the fibroblast target cells. Cytopathogenic effects above and beyond this silica toxicity were seen only in the cultures treated with supernates from macrophage-silica cultures. These cytopathogenic effects were unaffected by freeze thawing of the macrophage supernates and were unaffected by filter sterilizing. All subsequent experiments thus used filter sterilized supernates. These cytopathogenic effects usually occurred with undiluted supernates, beginning about days 6 or 7. The fibroblasts rounded up, because refractile and granular, and gradually underwent dissolution so that by Day 10 such dissolution was complete. Such effects were not usually seen with dilutions of the microphage-silica supernates. Regardless of the length of incubation of the fibroblast cells with the silica-macrophage supernates, no increase or uptake in hydroxyproline was noted with the cells in the washed pellet. However, marked increases were noted in the media from each affected culture when compared with the control. Similar results were obtained from subsequent experiments, but the hydroxyproline values fluctuated as a function of the cell concentration in the cultures. In the 10-day period of observation, 1:100 dilutions of the silica-macrophage cultures had no observable stimulatory effect. (Author abstract modified)

36250 **APTIC NO. 59061**

Carnow, Bertram W., Virginia Carnow, and Bernard F. Rosenblum

UNSUSPECTED COMMUNITY LEAD INTOXICATION AND EMISSIONS FROM A SMELTER. *Preprint, Illinois Univ., School of Public Health and El Paso City-County Health Dept., El Paso, Tex., 25p., June 25, 1973.*

Surveillance of a population in El Paso, Texas exposed to a large point source of lead (smelter) revealed many previously undetected cases of undue lead absorption and lead intoxication. The population in general and children in particular living close to the smelter had much higher blood lead levels than a control population in other areas of the city not so exposed, and there appeared to be a direct relationship between elevated blood lead levels and the distance from the stack as well as ambient air lead levels. Physical examinations and laboratory tests of children who had no overt signs of lead poisoning revealed multiple abnormalities and evidence of disease. Evidence that airborne lead constitutes a serious hazard to an exposed population suggests that much greater concern must be expressed regarding the massive environmental contamination of lead from automobile exhausts. Greater efforts must also be exerted to assess long term subclinical effects of airborne lead as a toxic substance. (Author summary modified)

36251 **APTIC NO. 58978**

Chernichenko, I. A., G. I. Vinogradov, and I. M. Karandakova

HYGIENIC ASSESSMENT OF THE ALLERGIC ACTIVITY OF PHTHALIC ANHYDRIDE INHALED BY THE ORGANISM. *(Gigiyenicheskaya otsenka allergennoy aktivnosti ftalevogo angidrida pri ingalyatsionnom postuplenii v organizm). Text in Russian. Gigiena i Sanit., no. 12:16-20, 1973. 6 refs.*

The allergenic activity of inhaled phthalic anhydride was studied in guinea pigs. Following sensitization with 0.0015-1.5 g doses, the animals were exposed to 0.75-750 mg/cu m concentrations of phthalic anhydride. The lowest concentration that caused sensitization was found to be 7.5 mg/cu m, well above the single-time and daily average maximum allowable concentrations (0.1 mg/cu m). Phthalic anhydride is concluded to be a weak allergenic agent.

36252 **APTIC NO. 59302**

Cotes, J. E., J. M. Dabbs, A. M. Hall, A. T. Axford, and K. M. Laurence

LUNG VOLUMES, VENTILATORY CAPACITY, AND TRANSFER FACTOR IN HEALTHY BRITISH BOY AND GIRL TWINS. *Thorax, 28(6):709-715, Nov. 1973. 20 refs.*

Normal values are reported for the lung volumes, ventilatory capacity, and transfer factor of 212 healthy British twin children aged 8-16 years. The boys and girls share a common relationship to height for the residual volume, peak expiratory flow rate, and KCO (transfer factor per litre of lung volume). For the inspiratory capacity and the transfer factor, also its membrane component (Dm), the values for the boys exceed those for the girls by, on average, 10%. This difference may be due, at least in part, to the boys taking more exercise. (Author abstract)

36253 **APTIC NO. 58582**

Eguchi, Takeo, Katsumi Nagayama, Norio Hanioka, Hiroshi Maruya, Katsuys Shiraga, and Hiroshi Oguma

HEALTH SURVEY OF SCHOOLCHILDREN IN KURASHIKI CITY. *(Kurashiki-shi gakudo no kenko chosa. Dainiho: rentogen o chushin to suru kenshin kekka.) Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):474, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973. Paper 206.)*

Following the first report on the health of children of Kurashiki, 112 children from the polluted area and 13 from the control area were requested to have thorough physical examinations, and 82 and 11 responded. A total of 91 from the two groups received chest x-ray test. A complex method of statistical analysis of the x-ray results was specially devised and the results are presented in tables. The physical examination, x-ray observations, and hematological examinations all pointed to the prevalence of bronchial asthma cases in the polluted area. Epidemiological studies of schoolchildren in polluted area should be centered upon that of bronchial asthma.

36254 **APTIC NO. 58594**

Eguchi, Takeo, Katsumi Nagayama, Norio Hanioka, Hiroshi Maruya, Katsuya Shiraga, and Hiroshi Oguma

HEALTH SURVEY OF SCHOOLCHILDREN IN KURASHIKI CITY, I REPORT: ABOUT COMPLAINTS (Kurashiki-shi gakudo no kenko chosa, Daiippo: yuso no hikaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):473, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 205.)

The Kurashiki Medical Association and the municipal government conducted a special health examination on the health of public schoolchildren with reference to nine schools in the polluted Mizushima District and five schools in unpolluted suburban Kurashiki. A modified Fletcher questinnaire with additional questions on the eye, nose, throat, and odor was given out in Dec. 1971 and July 1972 for weekly entries. The response rates were 100% both times. The rates for cough, sputum, short breath, wheezing, all chronic bronchial symptoms, were all significantly higher among the children of the Mizushima District. Also, more than one-week absenteeism due to respiratory diseases, or more than two absenteeisms in three years, were both significantly higher in Mizushima. Various discomforts of the eye, nose and throat, such as lachrymation, blinking of the eye, eye irritation, red eyes, runny nose, suffocating, sneezing, were all significantly more prevalent in Mizushima. The figures are presented in the table.

36255 **APTIC NO. 59141**

Emerson, Peter A.

AIR POLLUTION, ATMOSPHERIC CONDITIONS AND CHRONIC AIRWAYS OBSTRUCTION. *J. Occup. Med., 15(8):635-638, Aug. 1973. 5 refs.*

Serial spirometric measurements were made in 18 patients living in the London area who were suffering from some degree of reversible chronic airways obstruction (chronic bronchitis or asthma); observations were performed at weekly intervals over periods ranging between 12 and 82 weeks. The changes observed were correlated by means of a computer program with the relevant changes in measurements of atmospheric conditions and air pollution. The most useful test of airways obstruction proved to be the FEV1 (Fast Expiratory Volume in 1 sec); significant correlations for the FEV1 were found with temperature in six patients, with wind speed in four, with humidity in four, and with pressure in three. There was a significant correlation with sulfur dioxide levels in only one patient, and no correlation of significance existed between smoke levels and any of the patients. The amounts of SO2 and smoke in London air appear to have fallen to levels which have little direct effect on pulmonary function in patients with chronic airways obstruction. (Author summary modified)

36256 **APTIC NO. 59204**

Feron, V. J., D. De Jong, and P. Emmelot

DOSE-RESPONSE CORRELATION FOR THE INDUCTION OF RESPIRATORY-TRACT TUMOURS IN SYRIAN GOLDEN HAMSTERS BY INTRATRACHEAL INSTILLATIONS OF BENZO(A)PYRENE. *Eur. J. Cancer, 9(5):387-390, May 1973. 6 refs.*

A dose response correlation was developed for the inducement of respiratory tract tumors in Syrian golden hamsters by intratracheal instillation of benzo(a)pyrene (BP). The animals received weekly one intratracheal instillation during a period of 52-weeks. Each instillation consisted of 0.2 ml 0.9% sodium chloride solution, in which 0, 0.0625, 0.125, 0.25, 0.5, or 1.0 mg BP had been suspended. A positive dose response correlation was demonstrated by the increasing numbers of hamsters bearing respiratory tract tumors with increasing doses of BP, and by a distinct Oshortening of the latent period for these neoplasms with increasing quantities of BP administered. In hamsters receiving a total dose of 5.25 mg BP, only four tumors developed. In contrast, there were 58 tumors among the hamsters receiving a total dose of 52 mg BP. The most frequent non-neoplastic lesions observed in the respiratory tract included hyperplasia and squamous metaplasia of the tracheobronchia lining epithelium, periobronchiolar adenomatoid lesions, and several types of alveolar metaplasia. The extent and frequency of these alterations clearly increased with increasing dose levels of BP.

36257 **APTIC NO. 58980**

Fournier, E.

FREE RADICALS AND TOXICOLOGY. *(Radicaux libres et toxicologie). Text in French. Eur. J. Toxicol. Hyg. Environ., 6(3):109-122, May-June 1973. 26 refs.*

Relationships between free radicals and toxic effects using electron paramagnetic resonance spectroscopy as a tool for the detection of toxic-free radicals in tissues are described. The EPR spectroscopy is suitable for the detection of toxic-free radicals formed in the atmosphere that act upon the bronchioloalveolar surface. The toxic substances acting upon these surfaces are in gaseous form, and the presence of oxygen facilitates the peroxidation reactions. Nitrous vapors, ozone, and pressurized oxygen are among the principal initiator gases. Ozone and nitrogen oxides form free radicals in water whose biological activity may be extremely strong, and which may lead to total destruction of the cellular structures. Even at very low concentrations, the free radicals initiate lipoperoxidation with the formation of abnormal lipids (cetodienes and aldodienes) and proteins which finally explains such pathologic formations as hyaline membrane and myelinic structures.

36258 **APTIC NO. 58596**

Fukushima, Yasumasa, Koichi Nobutomo, and Noburu Ishinishi

STUDY ON THE RELATIONSHIP BETWEEN THE VALUE OF THE AIRWAY RESISTANCE AND THE INDEXES OF THE OTHER PULMONARY FUNCTIONS. *(Kokyu teikochi ni tsuite no ichi kosatsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):479, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 211.)*

The normal limits of respiratory resistance were examined by a new respiratory resistance meter, and the relationship with other lung functions were examined. Kitakyushi residents of 3 yr or more, above the age of 40, 658 were chosen at random and their lung functions were examined. The respiratory resistance, peak expiratory flow, forced expiratory volume, and forced vital capacity were tested and the MBRC questionnaire was given. Those diagnosed to have chronic respiratory diseases were eliminated and the remaining 415 were examined again. The average respiratory resistance was 3.3 cm H2O/L/sec for men and 4.2 cm H2O/L/sec for women. The resistance increased with the age but not significantly. The resistance index had a reversed correlation with the peak expiratory flow, FEV 1.0, % FEV but had no correlation with FEV 1.0%. The normal upper limit of respiratory resistance may be considered 5.3 cm H2O/L/sec for men, and 6.4 cm for women. The correlation and lack of correlation suggest that respiratory resistance does not reflect directly the resistance of the respiratory tract alone, but is affected by the lung and chest resistance.

36259 APTIC NO. 58336

Ginzburg, E. A., M. V. Silova, M. J. Kornejeva, E. V. Levtonova, A. M. Sergejev, V. M. Romanov, M. S. Filonenko, E. S. Ivanova, M. P. Altynova, and M. S. Tolgkaja

X-RAY PICTURE OF NON-PROFESSIONAL PLEURAL ASBESTOSIS. *(Roentgenbild der nichtberufsbedingten Asbestose der Pleura). Text in German. Radiol. Diag., 14(3):307-312, 1973. 10 refs.*

In a serial examination of 25,769 persons in a district of the Chakassic Autonomous Territory of the U.S.S.R., pleural calcifications were found in 488 patients. Based on the obtained results, these are nonprofessional asbestoses. The radiographic examination led to the demonstration of the following principal signs: calcification of the parietal pleura, pleural reaction in the sense of layerings, pleurodiaphragmatic, and pleuropericardial adhesions, pneumosclerosis with emphysema, and deformation of the thoracic skeleton.

36260 APTIC NO. 58897

Greenberg, Mark A., Kenrad E. Nelson, and Bertram W. Carnow

A STUDY OF THE RELATIONSHIP BETWEEN SUDDEN INFANT DEATH SYNDROME AND ENVIRONMENTAL FACTORS. *Am. J. Epidemiol., 98(6):412-422, 1973. 23 refs.*

A study of the relationship between sudden infant death syndrome (SIDS), a major cause of death in children on week to one year of age, and the pollutant sulfur dioxide as well as the relationships between SIDS and certain meteorologic variables (temperature, wind speed, precipitation, and humidity), using a stepwise, multivarient regression model, was undertaken by examining 942 infant mortalities over a 4-year period in Chicago. An inverse relationship between SIDS and temperature in three of the four years of the study was the only consistent finding. No consistent relationship was found with the other meteorologic variables, and no significant differences in SO2 concentrations were found in comparing days when a SIDS death occurred and control days in the same community during the same season of the year. (Author abstract modified)

36261 APTIC NO. 59004

Heppleston, A. G. and A. E. Young

UPTAKE OF INERT PARTICULATE MATTER BY ALVEOLAR CELLS: AN ULTRASTRUCTURAL STUDY. *J. Pathol., vol. 111:159-164, 1973. 19 refs.*

Particulate mineral matter deposited on the alveolar surface film from atmospheric suspension may be eliminated by the luminal route, remain in the alveoli, or enter the pulmonary interstitium. The uptake of particulate matter by alveolar cells was studied by applying drops of India ink (containing carbon particles less than 50 nm in size) diluted with N-saline to the external nares of male mice. The deep respiratory movements rapidly atomized the suspension which was thus inhaled in droplet form. This procedure was repeated five times on successive days, and animals were killed on the day of the last aspiration and subsequently at intervals of 3-4 days up to 24 days. The particles were taken up by alveolar macrophages, and most remained in the alveolar spaces. Dissolution of macrophages ensured that the alveolar epithelium was repeatedly exposed to extracellular particles. Carbon in small amounts was readily identified in the cytoplasm of a minority of type I epithelial cells, but none was detected in type II cells. The contention that granular pneumocytes are secretory rather than phagocytic cells was supported. Transfer of very fine, submicron particles of inert material from alveolus to interstitium may be effected through type I epithelium. Larger particles, such as are inhaled occupationally by man, may achieve an interstitial location as a result of reticulin incorporation into alveolar walls with subsequent renewal of the epithelial lining, till eventually the alveoli are overrun and an area of parenchyma is consolidated. (Author summary modified)

36262 APTIC NO. 58736

Hoenig, Stuart A., Edwin M. Bebee, Cooley Butler II, and James E. Summerton

EXOELECTRON EMISSION FROM FRESHLY GROUND SILICA AND THE INDUCTION OF SILICOSIS. APPENDIX FROM: DETECTION TECHNIQUES FOR TENUOUS PLANETARY ATMOSPHERES. *Arizona Univ., Tucson, National Aeronautics and Space Administration Grant NGL-03-002-019, 35p., 1973. 25 refs. (Presented at the American Industrial Hygiene Association Meeting, Boston, Mass., May 23, 1973.)*

NTIS: N73 29869

The exoelectron emission from silica and silica minerals during and after grinding was investigated. The post-grinding electron emission is strongly dependent upon the silica content of the ground material and contamination by trace metals, i.e., iron and aluminum. It may have a direct correlation with the induction of pulmonary lesions associated with silicosis. To investigate this, red blood cells (RBC) were used as a model system for studying the effects of silica on biological membranes. The silica-RBC interaction results in lysis of the RBC which is detected as a change in optical density. Silica particles adsorb protein during the process of damaging membranes and are rendered inactive for lysis of RBC. Selective removal of this adsorbed layer reactivates the membrane-damaging properties of the silica particles. The presence of a trace amount of aluminum substantially decreases and a trace amount of iron increases the rate at which silica dust attacks RBC. A rationale and supporting evidence are presented to explain the common observation that there is a time-dependent decrease in the pathogenicity of silica dust in an industrial environment while no such time-dependent decrease is seen in controlled laboratory experiments. (Author abstract)

36263 APTIC NO. 59277

Hori, Norio

ON CHORDITIS NODOSA OF SCHOOLCHILDREN IN MIZUSHIMA. *(Kurashiki-shi Mizushima chiku gakudo ni tahatsushita kessetsusei seitaien). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):484, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 216.)*

Based on the results of questionnaires given to children in Kurashiki elementary schools in December 1971 and June 1972, 458 children of the Mizushima District were given examinations of pharynx and 117 were found to have chronic pharyngitis. Because of the notable increase of children with complaints for hoarseness, the vocal cords of the children of the Mizishima District were examined and compared with the children of schools in unpolluted area. In the four elementary schools of the polluted area, 236 out of 3172 had hoarse voices and 67 vocal nodules (choriditis nodesa). The morbidities in these schools ranged between 1 and 2.9%. In one control school, 2 out of 241 children were hoarse but none had vocal nodules. In the school with 2.9% morbidity, out of 595 children, 51 had chronic rhinitis; 10 had chronic inflammation of nasal cavity; 9 had allergic rhinitis; 6 had chronic tonsilitis; 24 had enlarged tonsils; 61 had chronic pharyngitis; 60 had chronic laryngitis, and 17 vocal nodules.

36264 **APTIC NO. 59287**

Ichikawa, Isamu and Eiji Yokoyama

EFFECT OF OZONE ON RAT LUNG PHOSPHOLIPIDA. *(Ratto hai rinshishitsu ni taisuru O3 no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):491, Oct. 1973. 8 refs. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 223.)*

The effect of ozone on the resiliency of the lung phospholipids has been reported by various scientists. Here, the mechanism and lipid metabolism changes as to effects of O3 exposure were examined by experimental exposures of rats to O3. After exposing nine week-old rats and six month-old rats to 1 ppm of O3 for 3 hr, the rats were killed, the lungs dissected, and the lipids taken out by the Folch method. The lipids from the airway were also extracted. The quantity of phospholipids were measured by the King method. Intake tests were given to lung tissues using radioactive phosphoric acid, palmitic acid, linoleic acid, and glycerol-3H. With the nine week-old rat group, there was a slight decrease of intake with the exposed group, though not significant.

36265 **APTIC NO. 58455**

Jones, P. and G. Nickless

THE DETERMINATION OF MERCURY (INORGANIC AND ORGANIC FORMS). *Proc. Soc. Anal. Chem., 40(11):269-271, Nov. 1973. 6 refs.*

The two main techniques for analysis of mercury in environmental studies were studied, and their accuracy and precision checked by analysis of standard reference materials and participation in round-robin surveys. The techniques are flameless atomic absorption combined with a reduction-aeration method for determining inorganic Hg and gas-liquid chromatography coupled with electron-capture detection for organic Hg. Work was also carried out on the determination of inorganic mercury by gas chromatography, which could prove to be a useful alternative to flameless atomic absorption. Atomic absorption was tested on coal, sediment, fish, leaves, and liver samples. Gas chromatography or organomercury compounds was tested on fish samples. Gas chromatography of inorganic Hg was tested on tissue samples.

36266 **APTIC NO. 59095**

Jouan, M.

AIR POLLUTION AND PUBLIC HEALTH. *(Pollution atmospherique et sante publique). Text in French. Ann. Mines (Paris), 1973:15-22, Nov.-Dec. 1973. 3 refs.*

General problems of outdoor air pollution by sulfur dioxide, particulate matter and black smoke, and their effects on public health are discussed. The study of the effects of outdoor air pollution is made difficult by the fact that a multitude of air pollutants of varying concentrations act upon subjects with greatly varying susceptibility. Animal tests and epidemiological surveys over selected populations are suitable for the study of the effects of air pollution on the organism. The bronchopulmonary and cardiovascular systems were affected by high concentrations of SO2. While the SO2 concentrations commonly encountered are not toxic for the human organism, the effect even of low concentrations may be aggravated by the association of SO2 with fine dust particles. Allergic phenomena such as asthma, increased incidence of bronchopulmonary cancer, rachitism, and otorhinolaryngitis, and infections of the respiratory tract are amoug the consequences of exposure of SO2 and particulate matter. Relationship between the absenteeism and the SO2 and black smoke concentrations was established for schoolchildren. Increased mortality and morbidity due to daily average SO2 and smoke concentrations of 500 micrograms/cu m, aggravation of pulmonary affections due to 500 250 micrograms of SO2 and 250 micrograms of smoke, and respiratory diseases due to 100 micrograms/cu m concentration were determined. The maximum allowable yearly average SO2 concentration should be set at 60 micrograms/cu m, with 98% of all values being under 200 micrograms/cu m. The corresponding limit for particulate matter should be 40 micrograms/cu m, with 98% of all values under 120 micrograms/cu m.

36267 **APTIC NO. 58580**

Kaneko, Fusa

EXCESS DEATH THROUGH THE AIR POLLUTION IN OSAKE CITY (V). *(Taiki osen ni yoru shibosha su no zodai ni tsuite (dai 5-ho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):466, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 198.)*

The correlations between mortality by diseases and indexed pollution and temperature factors was investigated. The data for mortality, sulfur dioxide index, dusts, and temperature were obtained from the Osaka Municipal Health Inst. and the Municipal Environmental Protection Research Inst. for the period of Jan. to Dec. 1970. Sulfur dioxide level, dust measurement, and temperature were indexed singly and in combination. Correlation between environmental factors and diseases differ depending on the type of disease. The correlation was higher when the pollution index and temperature index were added than when environmental factors were used singly. Both in winter and summer, the higher the environmental index, the higher was mortality. However, not all diseases were affected similarly by higher environmental indices. This suggests that some diseases are affected directly by one or more environmental factors, whereas others are affected gradually, or are not affected at all by some of the environmental factors.

36268 **APTIC NO. 58857**

Katsunuma, Haruo

SEVERAL QUESTIONS ON THE HUMAN BODY AND LEAD. *(Seitai no namari to no kosho o meguru ni-san no mondai). Text in Japanese. Rodo no Kagaku (Dig. Sci. Labor), 28(10):4-10, Oct. 1973.*

After discussing various forms of lead exposure in occupational environments and in accidents, exposures to automotive exhaust gas lead and the human health are discussed. A continuous investigation has been carried on since 1969 on the relationship of traffic amount and the lead content in the sand and mud on the roads of Tokyo. A relatively clear correlation was found. In the 1970 investigation, at the intersections with 3000 cars/hr, the lead concentration in the air ranged between 1.2 and 8.9 micrograms/cum; three intersections had more than 5 micrograms. The health of people living in this sort of environment showed a lower activity of delta-aminolevulinic acid in the red blood cells compared to those living in unpolluted areas. The effects of lead in the air on the kidney and urine were examined by animal experiments. At a certain level, the renal tubule cells began to form nuclear containing bodies. The lead content in each organ increased with the increase of lead administration, and the content in the bones and kidney showed an especially clear sign of increase. The relationship between the lead concentration in the air and the lead levels in the blood and urine are plotted. Up to 10 ppm of lead in the air, the blood lead level is 10-30 micrograms/dl, and the urine lead level is 15-50 micrograms/l; at this level, the appearance of health is completely preserved; but above that level, the ALA-D activity in the red blood cells begins to drop and the urine ALA begins to rise.

36269 **APTIC NO. 58774**

Kawai, Kiyoyuki, Koyu Nozaki, Yoshimi Matsumara, and Kazuo Fukada

LONG TERM INHALATION OF HEAVY OIL COMBUSTION PROTUCT. *(Juyu nensho seiseibutsu kyunyu jikken, diaspanpo: choki jikken ni okeru kokyuki byohen.) Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):490, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 222.)*

A preliminary report is presented on experiments with long-term inhalation of fuel oil combustion products using rats. Five four-week old rats were grouped into a high concentration smoke group, a filtered smoke group, a low concentration group, a control group. Each group showed normal growth up to 16th week of inhalation experiments, but the weight growth began to slow down in the order of group I, III, and II. In 90 to 100 weeks, the average weight of rats in group I was 20% lower than that of the control group animals. Except for one premature death in group II (335 days), the life span of these rats ranged between 555 and 916 days. Causes of death were pituitary tumors malignant tumors outside the respiratory system, chronic kidney diseases, arteriosclerosis, and one other. Fuel oil combustion products causes lung damages such as bronchiolitis and anthracosis immediately after formation. With the average of 0.471 mg/cu m particle concentration inhaled continuously for two years, morphological symptoms will develop. At the level of 6.67 mg/cu m, fibrous growths of peripheral bronchial epithelium will develop and eventually turn into pavement epithelial metaplasis. These developments are caused by particulate substances.

36270 **APTIC NO. 58374**

Kimura, Kikuji

SUBJECTIVE EVALUATION OF AIR POLLUTION. *(Kuki osen no kankakuteki hyoka). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):383, Oct. 1973 (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 123.)*

The subjective evaluation of work environments was investigated by a questionnaire. Of the 16 questioned in an environment of 0.29 mg/cu m of dusts, close to 70% of men answered that they felt the air was slightly polluted and close to 20% felt no pollution. With another group of 27 men in an environment of 0.31 mg/cu m of dusts, 45% felt the air was slightly polluted and 47% felt nothing. The relationship between the feeling of unpleasantness and pollution, unpleasantness and odor were examined. Environmental factors that disturbed people most were examined with the groups of 16 and 27; for the former, the pollution disturbed 50% and the temperature conditions disturbed close to 40% at 24.4 C, and approximately 10% of them complained of the light at 750 lux. With the latter group, over 70% of people complained of noise (60 db), about 15% complained of the temperature (25.2 C), and over 40% about the lighting (600 lux), and only about 10% about the pollution (0.31 mg/cu m dusts).

36271 **APTIC NO. 58831**

Kita, Hiromasa, Tamenobu Kubota, and Hideyuki Muroya

A RAPID SPECTROPHOTOMETRIC DETERMINATION OF CARBOXYHEMOGLOBIN IN BLOOD. *(Bunko kodokei ni yoru kecchu issankatanso hemogurobin no jinsoku sokuteiho). Text in Japanese. Igaku to Seibutsugaku, 87(5):305-309, Nov. 10, 1973.*

A rapid spectrophotometric method for the determination of carboxyhemoglobin in blood is discussed. To investigate the range and accuracy of this method, a series of O to 100% COHb concentrations in blood samples was prepared for repeat determination. The values obtained showed good agreement with theoretical values, the values showed an accuracy comparable to that obtained by the Commins and Lawther method. Rapid determination of a large number of test samples is possible.

36272 **APTIC NO. 59142**

Kumagai, K., T. Sato, E. Saruta, S. Shibazaki, and H. Shibata

AIR POLLUTION AND THE PECULIARITY OF PLEURAL FLUID ON SPONTANEOUS PNEUMOTHORAX. *(Shizen kikyo ni okeru kyosui no seijo to taiki osen). Text in Japanese. Iryo (Medical Treatment), 27(12):1131- 1136, Dec. 1973. 20 refs.*

Spontaneous pneumothorax is observed to occur frequently in slender young men under daily living conditions. The direct cause of the cases was the rupture of the subpleural cysts on the surface of the lungs which had been expanded by the inflammation of the lungs. A thoracic cavity puncture revealed pleural fluid which could not be detected by x-ray, percussion, or auscultation. This pleural fluid contained enough leukocytes to make it turbid and the LDH value was as high as 1000 u. These cases represented 32.2% of the cases studied. Nitrogen dioxide and oxidants injure peripheral units of respiration in the lungs resulting in emphysema. The morbidity of spontaneous pneumothorax was significantly higher in polluted areas.

36273 **APTIC NO. 58937**

Kumazawa, Yasumasa and Yasutomo Nakashima

ON THE CORRELATION BETWEEN THE PREVALENCE OF CHRONIC BRONCHITIS AND THE COMBINED INDEXES OF SO2 AND SP. *(Mansei kikanshien yushoritsu to fukugo osen shihyo to no kankei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):477, Oct. 1973. 2 refs. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 209.)*

The relationship between chronic bronchitis morbidity and the combined indexes of sulfur dioxide and suspended particulates (SP) was studied. First the SO2 concentration index and the SO2 index function were obtained and the correlations of these with the morbidity were checked. Next, the complex index of SO2 and SP was obtained by the Green method and the correlation of this figure with morbidity was obtained. The SO2 and SP measurements used were taken from previously published records of official figures in the Osaka area. The calculated figures of SO2 multiplied by SP and morbidity showed a high correlation. Among the single index, the highest correlation was noted between the SO2 concentration and morbidity. In actual figures (measurements) the yearly averages of measurements between 1964 and 1968 and morbidity showed the highest correlation. With the combined index of SO2 and SP, both the cumulative index and the multiplication of separate index averages showed almost the same correlation. In each case, a higher correlation was obtained with the combined index than with single figures. These results indicated that the respiratory diseases were caused by suspended particulates as well as by SO2, and by cumulative effects of a long period of time.

36274 **APTIC NO. 58559**

Lawther, P. M., P. W. Lord, A. G. F. Brooks, and R. E. Waller

AIR POLLUTION AND PULMONARY AIRWAY RESISTANCE: A PILOT STUDY. *Environ. Res., 6(4):424-435, 1973. 14 refs.*

Two short series of daily measurements of pulmonary airway resistance were made on a single subject as pilot experiments for a long-term study of the effects of environmental factors. Measurements were obtained each morning after the subject walked 2.8 km to work through the London streets. The first experiment showed significant decreases of 1 cm water sec in specific airway resistance (SR) both between sets of measurements made just after the walk, after 30 min sedentary work, and again after inhalation of isoprenaline aerosol. Within each set, significant falls in resistance were observed. The second experiment showed that this was not due to the determination of thoracic gas volume made between each reading of SR. Combining both these series, significant correlations were found between SR measured just after the walk and the logarithms of daily mean concentrations of smoke, sulfur dioxide, and net particulate acid; increased SR was associated with higher levels of pollution. Strong correlations existed between all the measurements of pollution, and further analysis showed that most of the increases in SR associated with pollution could be accounted for by raised levels of SO2 or some closely allied pollutant. The effects of humidity and temperature were also noted. (Author abstract modified)

36275 **APTIC NO. 59100**

Lebowitz, Michael D. and Glen A. Fairchild

THE EFFECTS OF SULFUR DIOXIDE AND A2 INFLUENZA VIRUS ON PNEUMONIA AND WEIGHT REDUCTION IN MICE: AN ANALYSIS OF STIMULUS-RESPONSE RELATIONSHIPS. *Chem.-Biol. Interactions (Amsterdam), 7(5):317- 326, 1973. 17 refs.*

Mice were exposed to various doses of influenza A2 viruses and sulfur dioxide in exposure chambers, using a mouse-influenza model; and responses in the form of the amount of pneumonia produced and the amount of weight reduction produced by stimuli exposure were measured. Temperature, relative humidity, and length of exposure were all controlled; and control animals were in the same setting but did not have influenza virus or SO2. Virus exposure produced pneumonia even at low doses. Sulfur dioxide produced pneumonia at higher doses but appeared to have an inverse effect at lower doses when compared to control animals. The two combined produced more pneumonia than either one did separately. Dosage effects (correlations) were observed in both the production of pneumonia and the production of weight reduction. The stimulus-response method clarified and quantified the relationships found. (Author abstract modified)

36276 **APTIC NO. 58925**

Lewis, George P. and Linda Coughlin

LUNG SOOT ACCUMULATION IN MAN. *Atmos. Environ., 7(12):1249-1255, 1973. 24 refs.*

The acid-insoluble dust (soot) contents of 146 male lung samples obtained at autopsy within 24 hr of death from two consecutive unselected autopsy series at two general hospitals situated in towns with low levels of atmospheric pollution were measured. The mean content was 1.2 mg/g, giving an estimated mean total soot accumulation for both lungs of 1.7 g. A statistical significant trend was found between age and quantity of soot accumulated, although no associations emerged when occupational history and smoking habits were taken into account. Necropsy diagnoses of 13 patients dying with mention of a cerebrovascular accident indicated significantly greater quantities of lung soot. (Author abstract modified)

36277 **APTIC NO. 58920**

Miyaji, K., T. Takahashi, H. Kashiwagi, M. Yanagida, and Y. Karimata

TREATMENT AND PROPHYLAXIS FOR CHRONIC OBSTRUCTIVE LUNG DISEASES IN THE AIR POLLUTION AREA. *(Taiki osen chiku ni okeru heisokusei hai shikkan no taisaku to chiryo). Text in Japanese. Hai to Shin (Lung Heart), 20(3):195-204, Sept. 1973, 6 refs.*

The effects of air pollution on bronchial asthma, chronic bronchitis asthmatic bronchitis, and emphysema are discussed. Bronchial asthma occurs within 2 years of exposure to air pollution. Exposure to non-polluted air improved 60% of the patients within 3 months. If no improvement is shown within a year, the prognosis is usually poor. Pulmonary emphysema usually appears after 3 years of exposure to air pollution.

36278 **APTIC NO. 58513**

Moore, Wellington, Jr., Jerry F. Stara, Walden C. Crocker, Myron Malanchuk, and Rumult Iltis

COMPARISON OF (115M) CADMIUM RETENTION IN RATS FOLLOWING DIFFERENT ROUTES OF ADMINISTRATION. *Environ. Res., 6(4):473-478, 1973. 11 refs.*

Whole body retention studies of cadmium (115m) were carried out on rats following four different routes of administration: oral, inhalation, intraperitoneal, and intravenous. The retention curve for each route of administration was divided into two components. The first component reflected the initial rapid clearance of Cd(115m) primarily by the gastrointestinal tract and the second component indicated the absorption and turnover of Cd(115m). Extrapolation of the second component to the intercept gave initial absorption values of 93%, 91%, 41%, and 2.3% for intraperitoneal, intravenous, inhalation, and oral routes, respectively. Immediately after inhalation exposure, 9.7% of the total inhaled Cd was present in the lungs. The route of administration did not significantly influence the rate of elimination and biological half-life of the second component of the whole body retention curve. (Author abstract)

36279 **APTIC NO. 58783**

Nakatani, Keitaro and Ryoitsu Sato

REPORT ON THE INVESTIGATION OF THE HEALTH DAMAGES BY HEAVY METALS IN THE HOSOKOSHI AREA, KOSAKA TOWNSHIP, KATSUNO COUNTY, AKITA PREFECTURE. *(Akita-ken, Katsuno-gun, Kosaka-cho, Hosokoshi Chiku ni okeru jukinzoku ni yoru jintai higai ni kansuru chosa hokoku). Text in Japanese. Chu-tsu Byoin Iho (Bull. Chu-tsu Hosp.) (Akita), 14(7):85-93, 1973.*

Based on the findings of previous health examinations of the residents of the Hosokoshi area of Kosaka, Akita prefecture, further physical examinations were given in January 1972. Close to 100% of the residents, 75 people above 35 years of age, were examined and the urine was analyzed by sulfo-salicylic acid and sugar was analyzed by testape. The people with positive protein in the urine (25%, or 19 persons) were given tests on urine pH, serum potassium, phosphor, calcuim, alkaline phosphotase, GPT, the total protein in the serum, PA reaction, and the x-ray examination of pelvic bone and femur; protein polyacrylamide electrophoresis, amino acids, cadmium, copper, and zinc content in the 24-hour urine samples, and urine calcium and phosphor were measured. Generally high rates of protein and sugar positives were found and four cases of capillary protein and total amid acid discharge were found; protein positives tended to be low in the phosphor content in the serum and high alkali phosphotase; cadmium content in the urine was generally high and Ca/P ratio was also high. Two of the four patients who had capillary protein and amino acid urine discharge showed clear signs of Fanconi s syndrome and the other two showed some signs of the same syndrome. The chronic effects of Cd and other heavy metals on the health of the residents were ascertained.

36280 **APTIC NO. 58552**

Navratil, M. and J. Dobias

DEVELOPMENT OF PLEURAL HYALINOSIS IN LONG TERM STUDIES OF PERSONS EXPOSED TO ASBESTOS DUST. *Environ. Res., 6(4):455-472, 1973. 40 refs.*

Radiological signs of pleural hyalinosis were found in 50 former and present employees of an asbestos plant previously exposed to asbestos dust; in 25 of them asbestosis was present simultaneously. Periods of exposure, periods elapsed since onset of exposure, and mortality rate were ascertained until Aug. 1, 1972, in long-term studies. The mean values in the group with asbestosis were 22.4 years, 33.7 years, and 40%; in the group without asbestosis these values were 21 years, 27.6 years, and 12%, respectively. The difference in the mortality rate was statistically significant. Bronchogenic carcinoma was the main cause of death. The regular follow-up allowed differentiation of two stages in the chronological course of pleural hyalinosis -- simplex and complicata. The characteristic pattern of hyalinosis simplex is its long-term course with progressive calcification of the pleura without any striking response to the clinical state and respiratory function. In hyalinosis complicata, acute exudative inflammation of the pleura occurs without any proof of Tbe etiology, and in the subsequent period this stage develops into extensive pachpleuritic reaction, which differs from the usual adhesive postpleuritic processes. Some of the patients had general disease of the pleura affecting both sides. The restrictive disturbance of pulmonary ventilation was stressed simultaneously. Both cases of pleural mesothelioma, one verified by autopsy, the other clinically diagnosed without autopsy, were from the group hyalinosis complicata. Complicated hyalinosis was not found in any of the patients without exposure to asbestos with radiological signs of pleural calcification. (Author abstract)

36281 APTIC NO. 58599

Nobutomo, Koichi, Noburu Ishinishi, Takaho Shirahi, Noyuyoshi Miyazaki, and Nobuaki Shigematsu

STUDIES ON THE EFFECT OF AIR POLLUTION - THE EXAMINATION OF SPUTUM OF THE RESIDENTS IN OMUTA AND FUKUOKA CITY. *(Omuta, Fukuoka ryoshi no kattan saiboshin ni yoru hikaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):480, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 212.)*

The morning sputum specimens of 127 persons in Omuta were examined and various cells were found in 84 specimens. In less polluted Fukuoka, 65 of 399 examinees had sputum, and 45 had some cells. The cells observed were macrophages, neutrocytes, acidcytes, and bronchial epithelium cells. In both cities, the number of cells found in sputum was higher in proportion to the ages of examinees, but the degree of increase with the age was much higher in Omuta with macrophages and neutrocytes. There was no particular difference between two cities with regards to the numbers of acidcytes and bronchial epithelium cells. In Omuta, there was a remarkable increase of the percentage of sputum and the amount of smoking. More than half of male smokers of more than 20 cigarettes a day had discharge of macrophages, neutrocytes, and bronchial epithelium cells. In air-polluted Omuta, the human respiratory purification function by macrophages is considerably damages and as a result, the upper respiratory systems of the residents are very damaged. The prevalence of asthma in Omuta is probably not allergic in nature, since the numbers of acidcytes in the sputum specimens show no difference in two cities.

36282 APTIC NO. 59018

Obrikat, H. and K. Wettig

INFLUENCE OF PYRENE AND BENZOPYRENE ON CULTURES OF SACCHAROMYCES CEREVISIAE. *(Zur Einwirkung von Pyren und Benzpyren auf Kulturen von Saccharomyces cerevisiae). Text in German. Arch. Geschwulstforsch., 42(3):198-202, 1973. 8 refs.*

The influence of pyrene and 3,4-benzo(a)pyrene on cell growth, carbon dioxide formation, and the growth of polyploid cells in cultured Saccharomyces cerevisiae was studied. Both pyrene and 3,4-benzo(a)pyrene caused cell proliferation by about 30% during the one week-experiment when applied in concentrations of up to 100 micrograms/ml. Pyrene and 3,4-benzo(a)pyrene concentrations of 50 micrograms/ml increased the CO2 formation, while an increased 3,4-benzo(a)pyrene concentration of 100 micrograms/ml reduced the CO2 formation by 90%. The reduction in the CO2 formation by 100 micrograms of pyrene per ml was insignificant. An increased number of polyploid cells in 3,4-benzo(a)pyrene-treated cultures was observed.

36283 APTIC NO. 58553

Oya, Fumihiko, Shogo Ochiai, Yoshihiro Kitazawa, Takashi Mukaida, Osamu Asai, and Yoshiyuki Harada

PHOTOCHEMICAL AIR POLLUTION IN KANAGAWA (NO. 4), OCCURRENCE AND MISCHIEF OF PHOTOCHEMICAL AIR POLLUTION. *(Kanagawa-ken ni okeru kokagaku kogai ni tsuite (dai-4-ho), kokagaku kogai no hassei to higai jokyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):579, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 302.)*

Of the 31 emergency photochemical smog warnings issued in 1972 in Kanagawa prefecture, 16 cases produced some health damage victims, involving the total of 1383 persons. The number of warnings itself was three times more than 1971, but the number of victims was one tenth the number of 1971 (13,183). The area of damages in 1971 included eight cities; in 1972, the area expanded to include some western and central parts of the prefecture and 12 cities, covering some areas away from artery highways. Most of health damage cases occurred in school playgrounds during gym hours, and some in open classrooms. Of the total number of victims, 72% were schoolchildren ranging from kindergarten to senior high school, and 23.3% were adults. An overwhelming number of people complained of eye irritations and eye pains; others symptoms were throat pain, suffocation, coughing, headaches, dizziness, and nausea. Most symptoms were temporary and there was no case of hospitalization. As of August, emergency warnings have been issued 26 times in 1973, and 16 times involved some health damages on 2497 persons.

36284 APTIC NO. 58906

Ramprasad, G., M. M. Lahori, P. S. Siamwall, and N. G. Sathwara

EMISSION OF LEAD FROM AUTOMOBILES IN AHMEDABAD. *Indian J. Ind. Med., 19(3):79-88, July, 1973. 10 refs. (Presented at the Indian Association of Occupational Health, Annual Conference, 22nd, Octacamund, India, Feb. 26-March 1, 1972.)*

Lead concentrations were measured in the urine of shopkeepers working for many years along roads with high automobile traffic in Ahamedabad; concentrations of the metal in the surrounding air and soil were also determined. The study was conducted during the winter months with more or less stable atmospheric conditions. Averaged values of urine lead varied between 0.09 and 0.461 mg/l and suggested that shopkeepers working along heavily travelled roads were exposed to lead beyond the threshold limit values. The average atmospheric concentration of the metal along each road varied between 3.3 and 4.4 mg/10 cu m.

36285 APTIC NO. 58909

Rao, Madu, Phillip Steiner, Qutub Qazi, Ruben Padre, John E. Allen, and Morris Steiner

RELATIONSHIP OF AIR POLLUTION TO ATTACK RATE OF ASTHMA IN CHILDREN. *J. Asthma Res., 11(1):23-26, Sept. 1973. 12 refs.*

The effects of daily variation in the levels of sulfur dioxide and smoke shade on the attack rates of asthma in children were studied by examining the number of patient visits to a pediatric emergency clinic located in Brooklyn, N. Y. and air pollution indices obtained from an air pollution measuring center located adjacent the area from which the majority of patients came. An inverse relationship between daily levels of smoke shade in ambient air and number of visits to the emergency clinic was noted over a period of six months (October 1, 1970 to March 31, 1971); and patient visits were affected by variation in sulfur dioxide levels. There was a significant correlation between the level of SO2 and smoke shade, however.

36286 **APTIC NO. 59337**

Rosenfeld, Leonard M. and Domenic A. DeBias

SERUM PROFILE OF MYOCARDIAL ENZYMES DURING CHRONIC EXPOSURE TO LOW LEVELS OF CARBON MONOXIDE. *Proc. Acad. Sci., vol. 47:73-76, 1973. 23 refs.*

Carbon monoxide is one of the major sources of urban air pollution. Since exposure to CO converts hemoglobin to carboxyhemoglobin, thereby reducing the oxygen-carrying capacity of the blood and placing an additional strain upon the cardiovascular system to maintain adequate tissue oxygenation, this present investigation was undertaken to ascertain the effects of chronic exposure (up to 6 mo) to relatively low levels of CO (50-150 ppm) of dogs with prior myocardial infarction. Serum profiles of enzymes of the myocardium (CPK, GOT, LDH) throughout the 6-mo exposure period failed to provide evidence of secondary myocardial infarction. (Author abstract)

36287 **APTIC NO. 58595**

Sannomiva, Shigeto, Tatsujiro Ito, Yoshiharu Takahashi, Tetsuo Matsuoka, and Bunkichi Yokota

INVESTIGATION OF DESIGNATED RESPIRATORY DISEASE. CASES IN OSAKA CITY. *(Osakashi ni okeru tokutei kokyuki shikkan no jushinritsu chosa ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):476, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 208,)*

In eight overpopulated districts of Osaka, the records of patients diagnosed and treated for respiratory diseases at various public health service institutions were epidemiologically studied. The number of patients with chronic bronchitis, bronchial asthma, asthmatic bronchitis, and emphysema receiving examinations through the month of October 1972 were statistically studied. The ratio of these people was 0.36% to the total population of the eight districts. The number of health institutions was 1271, and the average number of population served by one institution is 1210. Morbidity was studied by sex, age, and the type of diseases. Chronic bronchial patients were high in number among the people in their 20s and above 40 years of age. Bronchial asthma was prevalent among infants and very old people, and asthmatic bronchitis was overwhelmingly prevalent among children below 14 year of age. Only 6.1% of all patients received their initial diagnosis more than 2 years ago. A very high rate of patients are new cases.

36288 **APTIC NO. 58921**

Sebayashi, T. and K. Ozaki

EFFECT OF PHOTOCHEMICAL-SMOG ON CHILDREN S HEALTH AND AGENTS OF AIR POLLUTION. *(Kokagaku sumoggu ni yoru gakudo no kenko shogai to taiki osen). Text in Japanese. Kogai to taisaku (J. Pollution Control), 9(11):1161-1168, Nov. 1973. 9 refs.*

Schoolchildren affected by the 1972 photochemical smog episode in Kobe city were examined. Urban children were bothered mainly by eye irritation, while the major symptom of children in suburban schools was respiratory distress. Oxidant emissions from both fixed and mobile sources are discussed. Meteorological effects on the oxidant concentration during air pollution episodes are discussed.

36289 **APTIC NO. 59014**

Sedov, K. R., Z. Ya. Shcherbitskaya, and V. I. Fedorova

EXPERIMENTAL PNEUMOCONIOSIS PRODUCED BY MEANS OF MARBLE DUST. *(Eksperimental nyy pnevmokonioz ot pyli mramora). Text in Russian. Gigiena i Sanit., no. 12:41-44, 1973. 1 ref.*

Experimental pneumoconiosis was produced in rats by single intratracheal introduction of three different types of fine marble dust with 86% of the particulates smaller than 5 micron. The free silica contents in the three different dusts were 15.1%, 4.3%, and 3.3%. The calcia and magnesia contents were in the respective ranges of 41.15-50.57%, and 2.12-7.88%. The different types of marble dusts produced similar changes, such as diffuse sclerotic pneumokoniosis, highly pronounced peribronchial sclerosis, and accumulation of marble particles in the bronchial and alveolar interstitium. Phagocytosis of small-size particles by alveolar macrophages, infiltrative-proliferative processes in the interstitial tissue, and the emergence of a few miliary nodes were observed. Emphysema, purulent inflammation, catarrhal desquamative processes, bronchiectasis, and metaplasia of the bronchial epithelium due to the accumulation of marble dust were found.

36290 **APTIC NO. 58598**

Shimizu, Tadahiko, Yoshizo Tsunetoshi, and Hiroshi Kono

EPIDEMIOLOGICAL STUDY ON THE SUBJECTIVE SYMPTOMS OF THE SCHOOLCHILDREN UNDER PHOTOCHEMICAL SMOGS. *(Kokagaku sumoggu ni yoru jikakushojo no ekigakuteki kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):472, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 204.)*

The subjective symptoms of victims of three photochemical smog incidents in Osaka in Sept. 1972 were investigated by questionnaires. On Sept. 13th, 20% of the total studied body of a junior high school, or 261 pupils, were affected in some way. On the 21st, 10.2% were affected on the 22nd 5.5% were affected similarly. There was a marked difference in the physical symptoms between group A, which had no gym class or had early gym classes, and group B, which had gym classes between 1 and 3 pm. Group A mainly complained of eye mucous membrane irritation; group B had sore throat, cough, and chest pain. Among group A, those who had a gym class between 11:30 and 12:30 noon experience some sore throat. The patterns of complaints for the second and third incidents were similar to that of the first. On Sept. 13, the level of nitric oxide between 1 and 2 pm jumped from 0.10 to well over 0.15 ppm, and nitrogen dioxide formed a similar peak, though not as high. The peak of oxidant level came at 3 pm and rose to 0.13 ppm.

36291 **APTIC NO. 58773**

Shishido, Masao, Kido Sugita, Fumio Higuchi, Arata Ogihara, Kazuo Abe, Masami Oda, and Takeshi Komuro

STUDIES OF PULMONARY FUNCTION BY FLOW-VOLUME CURVE (REPORT 2), ANALYSIS OF PULMONARY FUNCTION SUBJECT IN ISOGO-KU OF YOKOHAMA CITY. *(Flow-volume kyokusen ni yoru kokyukino no kenkyu, dainiho, Yokohama-shi Isogo jumin ni tsuite no kokyukino no kaiseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):468, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 200.)*

Residents of a polluted district of Yokohama, with normal respiratory functions, were choses and the flow-volume curve and maximum expiratory flow speed were examined, and 75%, 50%, 25%, and 10% positions of vital capacity, value by 1 m of height, value by 1 kg of weight, and the value by 1 sq m of body surface, and PFR were used to analyze the flow-volume curve by sex and age. The same analysis applied to other residents of the same area showed large fluctuations, but with this group, average values for each age group were greater and fluctuations were smaller. The average values of V75, V50, V25, and V10 decreased at a stable rate. The V50/V25 increased approximately in a straight line with the age and a significant correlation was obtained.

36292 **APTIC NO. 58343**

Szponar, Lucjan and Luba Bilczuk

METHAEMOGLOBIN LEVEL IN THE POPULATION OF VILLAGES IN THE REGION OF EXPOSURE TO AIR POLLUTION CAUSED BY NITROGEN ARTIFICIAL FERTILIZER PLANT. *(Poziom methemoglobiny u ludnosci wsi polozonej w rejonie oddzialywania zanieczyszezen emitowanych przez Zaklady Azotowe). Text in Polish. Polski Tygod. Lekar., 28(1):9-10, Jan. 1, 1973. 6 refs.*

The levels of methemoglobin was investigated in 283 subjects in a village lying within the area exposed to air pollution caused by nitrogen fertilizer plant. The subjects represented 88% of the population aged from 2-87 years old. Methamoglobin in blood was measured by the method of Evelin and Molloy, and the normal value was 0.13 g/100 ml of methamoglobin in blood. The greatest percentage of subjects with raised methamoglobin level was children (41.6%) and individuals above 60 years of age (37.7%). The proportion of subjects with raised methamoglobin level was lowest (21.15) in the adolescents and the productive group. The raised methamoglobin levels in the rural population living in the area exposed to air pollution from the plant indicates existence of a health risk. These results suggest that children and the elderly are those most exposed to the toxic action of nitrogen substances.

36293 **APTIC NO. 59105**

Takemoto, Kazuo

HISTOPATHOLOGICAL STUDIES OF THE RESPIRATORY TRACE CAUSED BY AIR POLLUTION. *(Taiki osen no kokyuki ni oyobosu eikyo (II)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):483, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 215.)*

Histopathological studies of the lungs and respiratory systems of dogs and pigeons were made to see the effect of pollutant depositions in the respiratory system. The pharynx, larynx, trachea, bronchi, and the peripheral areas of the lung were studied on 135 dogs in Tokyo, 351 dogs in Aichi prefecture, and 23 dogs in Yokkaichi. The ratio of mucocellular proliferation was 29.6% in Tokyo, 23.4% in Aichi prefecture, and 22.2% in Yokkaichi; the ratio of metaplasis of pavement epithelium was 18.5% in Tokyo, 9.4% in Aichi, and 4.3% in Yokkaichi. Approximately 77.5% of the mucocellular proliferation cases were in the trachea, and 48% of the pavement epithelium metaplasia were in the bifurcation of the trachea. Precarcinogenic tumor-type epithelial metaplasis were found in the lungs of two old dogs in Tokyo. There was no special relationship between the degree of lung deposition and the morbidity of the respiratory tract, and it could not be said that the older the animal the higher the morbidity. With the pigeons, there was no metaplasis or tumor.

36294 **APTIC NO. 59319**

Tomingas, Von R., F. Pott, and W. Dehnen

BIOLOGICAL TEST FOR CANCEROGENCITY OF POLYCYCLIC AROMATIC HYDROCARBONS. *(Biologische Testmodelle fuer die kanzerogene Wirkung von Polyaromaten). Text in German. Arch. Geschwulstforsch., 42(4):298-306, 1973. 10 refs.*

Because of the great expense involved, inhalation experiments are not suitable for testing the carcinogenicity of dusts. The tumor yield in animals depends strongly on the retention time of the carcinogens in the region of application. The elimination of benzpyrene from the lungs is decreased after preceding injury with quartz dust or ozone. Extracts of airborne dusts of three towns yield a lower tumor rate than the same quantity of pure benzpyrene. (Author abstract)

36295 **APTIC NO. 58597**

Tsuchiya, Shigetada, Ryo Yoshida, Takeshi Motomiya, Motoaki Adachi, Kenji Hayashi, and Akiko Kosaku

THE PREVALENCE OF RESPIRATORY SYMPTOMS IN SHIMIZU CITY - REPORT I. QUESTIONNAIRE METHOD. *(Shimizu-shi ni okeru kokyuki shojo yushoritsu chosa, daiippo: anketo chosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):481, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 213.)*

The total adult population (80,050) above 40 years of age residing in Shimizu were given a questionnaire on respiratory symptoms of cough, sputum, wheezing, short breath, rhinitis, and the smoking habits. The questinnaire recovery rate was 76.5%. An increase of morbidity was noted with the age increase in both sexes, and the age difference seemed to have much effect on cough, sputum, and short breath. When compared with the pollution indices of three areas of Shimizu with different degrees of pollution, in all items except for wheezing and short breath, morbidity increased in proportion with the degree of pollution. With each question item, morbidity increased with the age and the degree of pollution; sputum and short breath showed an especially clear increase of morbidity with the increase of pollution.

36296 **APTIC NO. 58317**

Umezawa, Tutomu

EFFECTS OF AIR POLLUTANTS ON THE EYE. *(Kotai to me, taiki osen o chushin ni). Text in Japanese. Nippon Ganka Gakkai Zasshi J. Japan Opthalmol. Soc.), 77(10):308-319, Oct. 1973.*

For a one-month period beginning July 18, 1972, 31 traffic policemen and 163 patrolmen were examined for eye and respiratory symptoms. The number of reports of subjective symptoms was in proportion to the level of pollutants in the air. Eye irritation morbidity was directly proportional to the levels of oxidant, sulfur dioxide, and suspended particulate matter and inversely proportional to temperature. Drinking, working, or staying up late on the previous night increased the rate of subjective symptom report. In Aug. 1972, examinations of the effects of air pollutants on the cornea were conducted with 1018 members of the Tokyo motorcycle units. Also on two successive days 21 members of the same units had their corneas examined immediately after driving along Tokyo s main highways. The surface of the corneas showed haze (keratitis superficialis punctata (k.s.p.)) in 6.4% of those examined. Immediately after driving along the main highways for 4 hr, 70% of the 21 members of the motorcycle units showed k.s.p. By the next morning, however, the symptoms of k.s.p. disappeared on 80% of the victims receiving any treatment. No subjectivy symptoms due to k.s.p. were reported. (Author abstract modified)

36297 **APTIC NO. 58806**

Watanabe, Hiroshi, Yutaka Inoue, Hiroshi Shimouchi, and Tsuguo Matsumoto

CARRIER RATE OF HEMOLITIC STREPTOCOCCI IN SCHOOLCHILDREN ON AIR POLLUTED AREA. *(Taiki osen chiku ni okeru gakudo into yorenkin hoyuritsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):469, Oct. 1973. (Presented at the Japan. Soc. Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 201.)*

Using hemolitic streptococci as an index, the bacteriological factors of the upper respiratory diseases of a polluted area of Amagasaki were studied. The pharynx swabs of the children of three schools in southern (polluted), central (medium polluted), and northern districts of Amagasaki were cultured and analyzed. The rate of carriers of hemolitic streptococci from the three schools averaged 17.9%, but the rate of the southern school (except for February 1971) was always higher than the other two, and the total number of average carriers for the southern and central schools was significantly higher than the northern school. When the February 1972 carrier rate of each school was compared with that of June, both southern and northern schools showed high figures (41% and 18.9%).

36298 **APTIC NO. 58780**

Watanabe, S., R. Frank, and E. Yokoyama

ACUTE EFFECTS OF OZONE ON LUNGS OF CATS. *Am. Rev. Respirat. Disease, vol. 108:1141-1151, 1973. 31 refs. (Presented at the American Industrial Hygiene Association Conference, San Francisco, Calif., May 1972.)*

Changes in respiratory mechanics and single breath diffusing capacity for carbon monoxide were compared in cats during exposure to low concentrations of ozone (1.0, 0.5, and 0.26 ppm). The animals were anesthetized, paralyzed, and mechanically ventilated through a tracheal cannula with a respiratory pump; exposure lasted an average of 4.6 hours. Pulmonary flow resistance, dynamic compliance, slow volume-pressure curves, vital capacity, and functional residual capacity were measured. Pulmonary resistance increased in almost all of the animals exposed to 1.0 and 0.5 ppm; only two of the cats exposed to 0.26 ppm showed an increase in pulmonary resistance. Atropine produced only a partial reversal of the increase in pulmonary resistance. Changes in dynamic compliance at 25 breaths per minute and diffusing capacity for carbon monoxide were less frequent and less marked than the change in pulmonary resistance. Vital capacity did not change; alveolar stability appeared to be unaffected, as evidenced by the shape of the volume-pressure curve during deflation. The results suggested that acute exposure to low concentrations of ozone affected the caliber of the airways more than either the transfer of CO across the alveolar-capillary membrane or alveolar surface forces (in the absence of pulmonary edema). The structural changes in these lungs were consistent with the functional changes. (Author summary)

36299 **APTIC NO. 59229**

Waters, Michael D., Donald E. Gardner, and David L. Coffin

VANADIUM: CYTOTOXIC EFFECTS ON RABBIT ALVEOLAR MACROPHAGES IN VITRO. *Preprint, Society of Toxicology, 31p., 1973. 58 refs. (Presented at the Society of Toxicology, Annual Meeting, 12th, New York, March 18-22, 1973.)*

The cytotoxic effect of vanadium was investigated on rabbit alveolar macrophages (AMs) in in vitro studies. The Ams obtained by lung lavage were exposed to particulate forms of vanadium pentoxide, vanadium trioxide, or vanadium dioxide over a concentration range of 0.1 to 100 micrograms V/ml (ppm V) of culture medium. Cell viability after a 20 hr exposure was reduced by 50% at these concentrations: 13 micrograms/ml V2O5, 21 micrograms/ml V2O3, and 33 micrograms/ml VO2. The toxicity was directed related to solubility in the order V2O5 greater than V2O3 greater than VO2. When V2O5 was dissolved in media prior to exposure of cells, only about 9 micrograms V/ml was required to reduce viability by 50% in 20 hr. Total cell numbers decreased 70% in 20 hr in dissolved V2O5 at 10 micrograms V/ml, compared to control cultures. Exposure of cells or cell free sonicates to levels of dissolved V2O5 as high as 50 micrograms V/ml produced only small changes in the specific activities of lysozyme or beta-glucuronidase. Acid phosphatase in the cell free system was 70% inhibited by dissolved V2O5 at 1 microgram V/ml. (Author abstract modified)

36300 **APTIC NO. 58454**

Yang, S. F.

DESTRUCTION OF TRYPTOPHAN DURING THE AEROBIC OXIDATION OF SULFITE IONS. *Environ. Res., 6(4):395-402, 1973. 17 refs.*

The reactions of tryptophan with manganese and sulfite were studied. The tryptophan was destroyed aerobically in the presence of Mn(++) and sulfite. The rate of destruction was greatly increased when horseradish peroxidase was added. The optimal pH for the reaction was 8.0. The destruction of tryptophan was dependent on the aerobic oxidation of sulfite. Superoxide dismutase inhibited sulfite oxidation and thus inhibited the tryptophan destruction. Tracer studies indicated that tryptophan was converted into at least four products. This study may have application to the toxic effects of sulfur dioxide air pollution.

36301 **APTIC NO. 58389**

Yeager, David W., Jacob Cholak, and Bernard G. Meiners

THE DETERMINATION OF CADMIUM IN BIOLOGICAL AND RELATED MATERIAL BY ATOMIC ABSORPTION. *Am. Ind. Hyg. Assoc. J., 34(10):450-454, Oct. 1973. 11 refs.*

The determination of cadmium in body tissues and in fluids, water, foods, and airborne dusts by a modified extraction atomic absorption spectrophotometric procedure used for the determination of lead in biological and related material is described. The modification involved an adjustment of volume to decrease the concentration effect noted when a relatively large volume of distilled water was used to bring the methyl isobutyl ketone (MIBK) layer into the neck of the volumetric flasks. A sensitivity of 0.010 ppm can be attained, and accuracies of analysis range from + or 10% for fractions of a microgram of Cd to about + or 4% for microgram quantities of Cd. Because of the known association of Cd with some Pb ores, 100 samples of blood from workers in various Pb industries were analyzed. No relationship between the concentrations of Pb and Cd was found. After deletion of 10 obviously aberrant results, a mean concentration of 0.2 microgram of Cd per 100 ml of blood was obtained for the remaining 90 subjects in the industrial population studied. (Author abstract modified)

36302 **APTIC NO. 58799**

Yoshimi, Shinichi and Hiroshi Maruya

COLD AT K HOSPITAL IN MIZUSHIMA - II REPORT, A STUDY ON THE RELATIONSHIP OF THE AIR POLLUTION. *(Mizushima chiku K byoin ni okeru mansei heisokusei shikkan; dainiho; chiiki to hassho no kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):482, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 214.)*

The ages and histories of COLD (congestive-obstructive lung diseases) victims of air pollution in the Mizushima area were investigated retrospectively. The patterns generally showed that air pollution increased the morbidity of persons with susceptible respiratory systems. A survey of patient residences and the geographical distribution patterns of air pollution were compared by dividing Mizushima into three districts. The morbidities of the three areas were all within 7.7 to 9.8% and were not significantly different. Case studies from Feb. 1969 to May 1973 were compared with the air pollution conditions of the same period. A high morbidity of aasthmatic attacks and fever was noted in Feb. 1969 when sulfur dioxide concentrations rose to 0.4 ppm; high morbidities for attacks and fever and one death by acute bronchitis and asthma were recorded in May 1973 when SO2 was 0.1 ppm and shortly after oxidant concentration rose to 0.1 ppm.

36303 **APTIC NO. 59089**

Zeedijk, H. B.

INVESTIGATION OF ASBESTOS BODIES AND ASBESTOS FIBERS FOUND IN THE LUNGS OF A MESOTHELIOMA PATIENT BY ELECTRON MISCROSCOPY. *(Elektronenmikroskopische Untersuchung von Asbestokoerperchen und Asbestfasern in der Lunge eines Mesotheliom-Patienten). Text in German. Microchima Acta, no. 6:977-984, 1973. 8 refs.*

Asbestos bodies and asbestos fibers found on necropsy in the lungs of a mesothelioma patient who had worked at a shipyard were investigated by electron microscopy. The bodies were normal asbestos bodies with amphibole asbestos as cores. The shells of the asbestos bodies were contained in large quantities of iron, and relatively small quantities of calcium and phosphorus. The ratios of these elements were largely the same as those in the organic substances of the lung fluid. Seventeen of the total of 27 free asbestos fibers investigated were chrysotile asbestos, and 10 were amphibole asbestos.

36304 **APTIC NO. 58414**

Environmental Pollution Committee, Akita (Japan), Chu-tsu Hospital

HEALTH EXAMINATIONS IN THE HOSOKOSHI AREA IN THE KOSAKA TOWNSHIP. *(Kosaka-cho Hosokoshi ni okeru kenko chosa). Text in Japanese. Chu-tsu Byoin Iho (Bulletin of Chu-tsu Hosp.) (Akita), 14(7):82-84, 1973.*

A general health examination and urinalysis were given in 1970 to 10 men and 41 women older than 20 years of age residing in the Hosokoshi area of the Kosaka township, Akita prefecture. More than 70% of these people are engaged in agriculture. About 59% of them, in contrast to 30-40% in other similar villages, complained of aches and pains in the limbs and hip and frequent fatigue and the total body fatigue. Forty-seven percent of the total examinees, and 73% of the female examinees older than 50 years of age had high blood pressure. Eleven out of 48 had protein in the urine. This area has had some pollution episodes in the past such as crop and produce failure, the 1963-1964 death and damages of more than 100 cattle and horses, and a high rate of asthmatic morbidity. Further examinations will be made to clarify the relation between the environmental pollution caused by the mines and physical damages.

36305 **APTIC NO. 58854**

Tokyo Metropolitan Government (Japan), Meguro District and Tokyo Metropolitan Meguro Public Health Center (Japan)

INVESTIGATIONS ON PHYSICAL DISORDERS CAUSED BY AIR POLLUTION - OBSERVATIONS MADE THROUGH THE HEALTH DIARIES FOR A YEAR. *(Taiki osen ni yoru shintai iyo chosa--hoken nisshi ni yoru ikkanen no kansatsu kara). Text in Japanese. 67p., Dec. 1973.*

The physical effects of photochemical smog were investigated in the suburban Meguro district including residential and commercial areas of 7.24 sq km, with a population of 148,000. In the past, 10 cases of photochemical smogs involving 36 victims were reported, but none of them involved schoolchildren. From July 1972 to June 1973, the total of 854 pupils of elementary school, junior high school, and senior high school were requested to keep a health diary. During this period, the oxidant concentration was measured daily and the correlation of measurements and physical disorders were investigated. The items of investigations included subjective symptoms on health, as well as the children s awareness of pollution in general. When the oxidant value was more than 10 pphm, or in part more than 9 pphm, physical disorders increased significantly. It was considered significant when the rate of symptoms more than doubled compared to the previous day. The disorder rate tended to be higher in summer. High concentration of oxidants tended to continue for more than a day, and within the period of a year, 86 days had oxidant concentrations higher than 9 pphm, of which, 65 days or 78% continued the level for more than two days. During these periods, the ratio of significant increase in physical disorder was 56%. Prevalent symptoms were eye irritation, pains in the throat, cough, and headaches. From January to March, headaches seemed frequent and eye irritation infrequent. Eye irritations occurred most frequently between April and August with predominence in August.

36306 **APTIC NO. 59006**

Yokohama Municipal Government (Japan), Pollution Control Bureau

PHOTOCHEMICAL SMOG CASES IN YOKOHAMA (FIRST REPORT). *(Yokohama-shi ni okeru kokagaku sumoggu hassei jokyo). Text in Japanese. Pollution Control Bureau Data no. 42, 121p., March 1973.*

Photochemical smog information is daily broadcast on television in Yokohama except for Sundays, between April and October. The accuracy is more than 90%. Between April 27 and October 15 in 1972, warnings were issued 33 times in Tokyo, 30 times in Kanagawa prefecture, of which 23 were in Kawasaki, and 10 times in Yokohama. On April 29, when no warning was given, oxidant concentration rose to 0.15 ppm at 11 am and stayed on until 6 pm, and reached the highest level of 0.37 ppm at 1 pm. The total reported cases of health damages caused by photochemical smogs in 1972 were 43 in Yokohama, involving 834 people. Most victims were schoolchildren (10.1% grade school; 67.6% junior and 14.5% senior high schools). The greatest number of victims, 240, were involved on April 29 in seven districts of Yokohama, between 10 am and 1 pm. Symptoms were eye and throat pains, cough, and breathing difficulties. The second largest incident was on June 11 in seven districts (some overlapping with April 29th), and involved 142 people between noon and 7 pm. Symptoms were coughs, throat, chest, and eye pains, and nausea. Agricultural produce damages were investigated between April and October; items of investigations were the topography, general environmental conditions, sunshine, ventilation, soil conditions, the size of produce, leaves, the total area, damaged area, and the ratio between the two, damaged locations, and insects. Monthly investigations were given on the 20th of the month and special investigations were given after high oxidant concentrations. Of the total 3575 specimens examined, 4.4% showed some form of damage; the ratio of damages after high oxidant concentrations ranged from 0.7 to 14.7% and was definitely higher than damages discovered on regular check-up days. Generally, leafy vegetables and radish and turnips were susceptible. Undamaged produce included cabbages, cauliflowers, cucumbers, eggplants, tomatoes, pumpkins, strawberries, carrots, potatoes, sweet potatoes, and the tri-leafed vegetables. Chlorosis, necrosis, and brown edges were noted.

36307 **APTIC NO. 59176**

President s Science Advisory Committee, Panel on Chemicals and Health

CHEMICALS AND HEALTH. *291p., Sept. 1973. 161 refs.* GPO

The size and nature of the risks involved in the use of chemicals, as well as the magnitude and character of the benefits they provide, are examined. Topics covered include: chemicals to improve human health; animal medicines, feed additives, and pesticides; naturally occurring toxicants, food additives, and cosmetics; household products and industrial chemicals; effluents and by-products; acquisition of knowledge, toxicology, and regulatory information; economic issues; regulatory practices and issues; and judgments about risks and benefits. Appendices are also provided concerning: causes of death with increasing rates in the 1960 s; other perspectives on health; deaths linked to various causes; economic data; economic trends in chemical products; and regulatory practices abroad.

1972

36308 **APTIC NO. 59237**

Antweiler, H.

COERGISM - TOXICOLOGIC ASPECTS OF THE EVALUATION AND STUDY OF THE BIOLOGIC ACTIVITY OF AIR POLLUTANTS. *(Kombinationswirkung*

- Toxikologische Aspekte bei der Beurteilung und Erforschung der biologischen Wirksamkeit luftverunreinigender Stoffe). Text in German. In: Medizinisches Institut fuer Lufthygiene und Silikoseforschung Jahresbericht 1971. Duesseldorf, Michael Triltsch Verlag, 1972, p. 120-128. 25 refs.

Toxicologic and general biological studies and experiments on the mechanisms of the simultaneous or successive synergic and antagonistic action of air pollutants on the human and animal organism are reviewed. Coergic action interferences of various air pollutants manifest themselves mostly in changes in the intensity, rather than in the quality, of the action. Air pollutants acting upon the organism may partly or totally suppress the action of another air pollutant, or the actions of two or more pollutants may add up, and certain pollutants may even potentiate the effect of others. Physical and chemical processes, such as adsorption of gaseous or liquid pollutants on solid ones, may lead to inactivation or potentiation of the toxic effect. The resorption of nitrogen dioxide is reduced by edema developed in the alveolar walls due to previous inhalation of this gas. The elimination of quartz dust from the lung may be retarded by sulfur dioxide, carbon monoxide, and NO2. Increased resistence to benzo(a)pyrene with the presence of quartz in the lung and after ozone inhalation was observed. Active interferences may be due also to changes in enzymatic activities brought about by other pollutants. Benzo(a)pyrene, methyl cholanthrene, and other aromatic hydrocarbons induce enzymes that accelerate their metabolism in the organism. The competition of different air pollutants for the same receptor in the organism may result in activation or potentiation. Both synergistic and antagonistic effects may result from physiological coergism, i.e., the interaction of pollutants due to their reactions with different receptors.

36309 **APTIC NO. 59233**

Baumann, H. and W. Weller

DISTRIBUTION OF QUARTZ IN THE ORGANISM. *(Verteilung von Quartz im Organismus). Text in German. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 10p. (May 3-5.)*

The distribution of different types of quartz was studied in rats that were injected with 50 mg of quartz in 1 ml isotonic saline solution. Up to two thirds of the quartz injected was detected, of which about 50% was found free in the abdominal cavity. While the omentum contained no quartz at all in a few cases, it contained 10-25% of the total quartz injected. The amount of quartz found in the lung and kidney was negligible, and the liver contained by 30 times less quartz than the omentum did. The spleen contained relatively a large quantity of quartz. The distribution in the regions and organs in the abdominal cavity was found to be independent of the type of the quartz dust injected, and it remained unchanged for several weeks. However, the retention, storage, and transport of quartz in the spleen and in the lymph nodes was found to be essentially determined by the properties of the quartz. A very high rate of retention, storage and transport to the lymph nodes of quartz dust with pure surfaces by the spleen was determined. The same type fo quartz with a three molecule surface layer of adsorbed silicic acid was retained to a lesser degree by the spleen, but this lymphotropic property was less pronounced for larger particles. The strongly lymphotropic quartz with clean surface had less damaging effect on the organs than the less lymphotropic, non-cytotoxic, silicic acid-covered quartz.

36310 **APTIC NO. 59248**

Brockhaus, A.

PARTICULATE AIR POLLUTANTS. *(Partikelfoermige Luftverunreinigungen). Text in German. Medizinisches Inst. fuer Lufthygiene und Silikoseforschung, p. 27-34, 1972. 7 refs.*

Studies on the deposition, transport, and elimination of inhaled dust are reviewed. Nearly quantitative deposition of dust particles with aerodynamic diamaters over 7 micron in the nasopharyngeal cavity was determined. The separation in the tracheobronchial zone is negligible with well below 10% for all diameters. The alveolar deposition has its maximum for a particle diameter of about 2 micron, and its minimum at 0.5 micron. Rapid increase in the rate of alveolar retention with decreasing particle diameter below 0.5 micron was observed. Respirable dust particles may contain small amounts of toxic gases adsorbed on their surface so that the toxic gases are accumulated in rather high concentrations on the contact site in the respiratory tract. Following deposition along the respiratory tract, the dust particles may be subject to mechanical transfer or dissolution. Inhaled dust can be transferred from the upper and lower sections of the respiratory tract into the gastronintestinal tract, and, into the blood or the lymph system.

36311 **APTIC NO. 59053**

Bruch, J.

NITROGEN DIOXIDE. *(Stickstoffdioxid). Text in German. In: Medizinisches Institut fuer Lufthygiene und Silikoseforschung Jahresbericht 1971. Duesselforf, Michael Triltsch Verlag, 1972, p. 110-119. 28 refs.*

Studies and experiments on the action mechanism, as well as on the cellular and biochemical manifestations of the acute and chronic toxicity of nitrogen dioxide are reviewed. Short-term exposure to NO2, which is retained in the respiratory tract at a rate of 80%, causes reversible changes in the lung function, e.g., tachypnea, and reduction of the tidal volume. Reduced exfoliative activity of the Clara cells of the respiratory bronchioles, loss of cilia in the ciliated epithelium, and appearance of rod-shaped intracytoplasmal crystalloid inclusions due to chronic exposure to 2 ppm NO2 in rats were observed. Lesion of type I pneumocytes was also noted. The findings indicate bronchiolitis as the first step in NO2-induced lesions. Reduction of the lumina of the respiratory bronchioles, and focal emphysema were observed in mice after 3-month exposures to 0.5 ppm NO2. Chronic exposure to NO2 also caused increased erythrocyte, hematocrite, and hemoglobin levels. Increased susceptibility to bacterial infections, e.g., by Klebsiella pneumoniae, increased lactate dehydrogenase level in the lung, damages of collagen and elastin, as well as the presence of peroxidized polyene fatty acids in lung lipid extracts were found in animals exposed to NO2.

36312 **APTIC NO. 59246**

Bruch, J.

ASBESTOS. *(Asbest). Text in German. Medizinisches Inst. fuer Lufthygiene und Silikoseforschung, p. 101-105, 1972. 24 refs.*

Studies and experiments on the carcinogenic and fibrogenic effects of asbestos dust are reviewed. Clinical-epidemiological studies revealed significant increases in the frequency of pulmonary tumors and mesotheliomas in cities with asbestos mines and asbestos processing industries, even in the part of the population that was not occupationally exposed to asbestos. Ferruginous bodies were found in the lungs of test animals following intratracheal injection of aluminum silicate needles and of glass fiber. Rats and hamsters, having inhaled glass fiber dust (needle-shaped particles) for 2 yr, developed foci of septal fibrosis and collagen fibers in the lymph nodes. The carcinogeneicity of asbestos dust is generally believed to be due to the inherent needle shape of the particles. Adenomatous growth of alveolar epithelium cells in pleural plaques after intrapleural injection of chrysotile was observed. Such stimulation of the alveolar epithelium is asbestos-specific since no such changes due to silicogenic quartz and inert dusts were observed.

36313 **APTIC NO. 58849**

Chiappino, Gerolamo and Giuseppe Briatico-Vangosa

THE EARLY PULMONARY LESIONS FROM ASBESTOS. POSSIBILITY OF A PRE-RADIOLOGICAL DIAGNOSIS OF ASBESTOSIS. *(Le lesioni polmonari da amianto in fase iniziale. Possibilita di diagnosi preradiologica dell asbestosi). Text in Italian. Med. Lavoro (Milan), 63(3-4):85-101, March-April, 1972. 11 refs.*

A lung surgically removed for carcinoma from a subject who had been exposed to a moderate risk of asbestosis was morphologically examined. Before the occurrence of evident changes of radiological pattern, the lung presents fibrotic changes along the lymphatic net. Foci of asbestotic alveolitis are present with microphamorrphages, very numerous sideocytes and localized foci of edema, as a consequence of direct microtraumas by fibers on the alveolar walls. These lesions are responsible for the early deficiencies of the respiratory function and of the appearance of siderocytes in sputum. The severe asbestotic fibrosis has a mixed origin. It appears that when clear radiological signs appear, the pneumoconiotic lesions have already become so severe that any means of medical prevention are inefficient. (Author summary modified)

36314 **APTIC NO. 58611**

Creasia, D. A., P. Nettesheim, and Anna S. Hammons

INCREASED EFFECTIVE HALF-LIFE OF INTRATRACHEALLY ADMINISTERED 51CR2O3 BY RESPIRATORY INFECTION. *Battelle Memorial Inst., Pacific Northwest Labs. and Atomic Energy Commission, Office of Information Services, Radionuclide Carcinogenesis, Proc. Hanford Biol. Symp., 12th Annu., Richland, Wash., 1972. p. 106- 118. 6 refs. (May 10-12.)*

NTIS: CONF-720505

The effect of influenza pneumonitis on the pulmonary half-life of 52 chromium oxide (Cr2O3) was investigated. The respiratory infection was initiated in female mice with PR8 influenza virus. The time course of the infection is such that the pneumonitis reaches its peak at about 10-14 days after virus inoculation. The infection markedly extended the pulmonary half-life of the radioactive particles when they were administered prior to, at the same time as, or 1 to 56 wk after infection with the virus. The distribution of retained 51Cr in the lungs of infected animals depended on the relationship between time of infection and time of 51Cr2O3 administration. The data are discussed in terms of an increased hazard to individuals with an active respiratory infection or with residual lung-tissue damage. (Author abstract modified)

36315 **APTIC NO. 59236**

Dolgner, R., K.-H. Friedrichs, and H. Steiger

COERGISM - METROLOGIC AND EPIDEMIOLOGIC PROBLEMS. *(Kombinationswirkung - Messtechnische und epidemiologische Probleme). Text in German. In: Medizinisches Institut fuer Lufthygiene und Silikoseforschung Jahresbericht 1971. Duesseldorf, Michael Triltsch Verlag, 1972, p. 90-95.*

General epidemiological and metrological problems of coergic air pollutants are discussed. Studies of the long-term effects of simultaneously acting air pollutants require knowledge of the long-term effects of the individual components, which can be obtained by animal tests and by epidemiological surveys. The methods of occupational hygiene can not be applied to the study of the coergism of air pollutants in the free atmosphere since the latter is characterized by the presence of a multitude of air pollutants of varying concentrations in time and space, pollutants that may enter a great variety of reactions before, during or after exerting their effect on the organism. Mortality studies are unsuitable for the study of coergic air pollutants, while comparative observations of the morbidity, as well as the reaction and developmental status of populations constitute a valuable tool in such epidemiological research. The selection of special populations, e.g., children, aged, and sick, is also useful. Moreover, populations that are exposed to identical air pollutants with only one missing in one population should be selected.

36316 **APTIC NO. 59180**

Epstein, Samuel S., Elsie Arnold, Joan Andrea, Willa Bass, and Yvonne Bishop

DETECTION OF CHEMICAL MUTAGENS BY THE DOMINANT LETHAL ASSAY IN THE MOUSE. *Toxicol. Appl. Pharmacol., 23(2):288-325, Oct. 1972. 16 refs.*

A total of 174 test agents, including pharmaceuticals, food additives, pesticides, and organic extracts of air and water pollutants, was tested for mutagenicity in mice using the modified dominant lethal assay. In concurrent control populations, the mean weekly pregnancy rate was 66% and exceeded 30% in 99% of all weeks; the distribution of weekly mean total implants per pregnancy was symmetrical around a peak of 11.5-11.9 and was never less than 8; mean early fetal deaths per pregnancy were less than 0.95 in 99.6% of weeks, and their distribution was highly assymetrical. These parameters afforded the basis for screening the large body of test data. All agents with mean weekly values beyond control limits were subject to analysis of variance for test and concurrent control data in all replicate experiments. Less than 10% of all agents tested were unequivocally mutagenic as determined directly by increased early fetal deaths per pregnancy and, in some instances, also indirectly by reduction in total implants per pregnancy; the majority of these are known alkylating agents. Additionally, about 5% of all agents tested yielded data which fell beyond control limits and which were significant at less than 5% by analysis of variance, but which, however, require furthur replication because of internal inconsistencies. (Author abstract)

36317 **APTIC NO. 58659**

Ferin, Juraj

OBSERVATIONS CONCERNING ALVEOLAR DUST CLEARANCE. *Ann. N. Y. Acad. Sci., vol. 200:66-72, 1972. 26 refs.*

That part of lung clearance which depends on the alveolar macrophages coupled to the ciliary-mucous transport process was studied by following titanium dioxide clearance in rat lungs. After exposure to dust, the onset of alveolar clearance begins within minutes. The number of macrophages increases rapidly within hours, and their motility is sustained even with particle load. After the rapid initiation, the consecutive removal of macrophages with particles from the alveoli is slower than their replacement, so that a buildup occurs. The retention half time for titanium dioxide and silicon dioxide particles is about 90 days. Clearance is a function of the initial lung burden, and the cleared amount may substantially increase in accordance with the lung burden. Multiple exposures may change the clearance rate, and so may the intervals between exposures. The efficiency of clearance may be improved by experimental means, but this increase never reaches the order of the initial lung burden effect.

36318 **APTIC NO. 59489**

Fodor, G. G. and G. Winneke

CARBON MONOXIDE: ITS EFFECTS ON THE CENTRAL NERVOUS AND THE CARDIOVASCULAR SYSTEMS. *(Kohlenmonoxid: Zentralnervoese und kardiovaskulaere Wirkungen). Text in German. In: Medizinisches Institut fuer Lufthygiene und Silikoseforschung, Jahresbericht 1971. Duesseldorf, Michael Triltsch Verlag, 1972, p. 96-103. 28 refs.*

Studies and experiments concerning the effects of carbon monoxide on the central nervous system and on the cardiovascular system are reviewed. Intensified arteriosclerotic changes of the aorta walls in cholesterin-fed rabbits inhaling

180 ppm CO for 10 weeks were observed. Pathologic changes of the aorta walls were also observed in animals with carboxyhemoglobin levels around 9% that were fed no cholesterin. Changes in the alveolocapillary gas exchange, in blood circulation, and in the myocardial metabolism due to COHb levels of 5-10% were found. Chronic exposure to low CO concentrations accelerates and aggravates the development of arteriosclerotic heart diseases. Subtoxic CO concentrations reduce the oxygen partial pressure in the cerebral tissue from about 8 torr to below 1 torr at COHb levels of about 2.5% and upwards. A tendency for increased deep sleep during the initial period of the exposure to CO was noted. Impairment of mental, sensory, and psychomotor functions under the influence of CO was evidenced. The maximum allowable CO concentration in the air should be set at 9 ppm, and the COHb value should be limited to about 2% on the basis of effects on the central nervous system.

36319 **APTIC NO. 58608**

Friberg, L., B. Holma, and R. Rylander

ANIMAL LUNG REACTIONS AFTER INHALATION OF LEAD AND OZONE. *Environ. Physio. Biochem., vol. 2:170-178, 1972. 14 refs.*

The effects of exposure to lead particles and ozone were studied in rabbits and guinea pigs exposed in subchronic inhalation experiments. In the rabbits, the clearance of 2 and 4-micron particles was studied about 3 and 6 mo after the initiation of exposure. In addition, the number of lung macrophages was measured at the end of exposure. In guinea pigs, the clearance of killed radioactive and viable E. coli was studied after 2 mo exposure. Exposure to Pb at a concentration of 76 and 161 mg/cu m and O3 at 0.5 ppm did not affect the lung clearance or the number of macrophages in rabbits. The Pb lead exposures did not significantly affect the clearance of particles or bacteria in guinea pigs, but O3 caused a significant decreased in the clearance of viable bacteria. (Author abstract)

36320 **APTIC NO. 59177**

Girsh, Leonard S.

AIR POLLUTANTS AND THEIR EFFECT ON BRONCHIAL ASTHMA. *Ann. Rev. Allergy, p. 215-226, 1972 (?). 29 refs.*

Various studies on the relationship of air pollution and meteorological variables to the occurrence of bronchial asthma are reviewed with particular emphasis on a study in Philadelphia involving collaboration between St. Christopher's Hospital for Children and the local meteorological and environmental health laboratories of the City. No specific pollutant appeared to account for increased frequency of asthma, and total oxidants correlated least well. A threefold greater incidence of asthma in children was observed during days of noteworthy air pollution; and, when stagnant air (manifested by high barometric pressure capping the environment) and noteworthy pollution coincided, the incidence of asthma rose to nine times the rate found on other days. The average daily level of air pollutants corresponding to 10% of days when air pollution was at its maximum in Philadelphia during the two year period of the study was as follows: 0.18 ppm sulfur dioxide, 0.15 ppm oxides of nitrogen, 0.05 ppm total oxidants, 12.6 ppm carbon monoxide, and 0.21-0.25 mg/cu m of air for suspended dust.

36321 **APTIC NO. 59174**

Goyer, Robert A. and Kathryn R. Mahaffey

SUSCEPTIBILITY TO LEAD TOXICITY. *Environ. Health Perspect., no. 2:73-80, Oct. 1972. 50 refs.*

Synergistic and antagonistic factors influencing human susceptibility to lead toxicity are reviewed. The influence of dietary calcium and iron increases soft tissue retention of a particular dose of lead. Synergism with other toxic metals has been suggested, but further investigations are recommended. Genetic factors, such as hemoglobin S and C, and glucose-6-phosphate dehydrogenase deficiencies are also suspected of increasing susceptibility to lead, but large scale clinical support of this relationship is not available. Renal disease decreases excretion of lead and enhances body stores and toxicity. The intrinsic metabolic factors which influence subcellular partitioning of lead are important. The binding of lead as a nondiffusible protein complex in the form of intranuclear inclusion bodies in liver and kidney may function as an intracellular detoxifying mechanism, as well as facilitate renal excretion of lead. (Author abstract)

36322 **APTIC NO. 59247**

Hilscher, W., J. Bruch, and G. Gauss

QUARTZ AND QUARTZ-CONTAINING MIXED DUSTS. *(Quartz und quartzhaltige Mischstaeube). Text in German. Medizinisches Inst. fuer Lufthygiene und Silikoseforschung, p. 137-145, 1972. 33 refs.*

Studies on the mechanism of the action of quartz and quartz-containing mixed dusts on organisms are reviewed. Functional irritation of the lymphocytes in silicosis and silicotuberculosis, manifesting itself in increased activity of oxidizing cell eyzmes, and in reduction of the activity of the glycolytic enzymes, was observed. Increases in the total lipid and phospholipid levels in the lung following intratracheal injection of quartz dust were evidenced. Following intratracheal injection and inhalation of quartz dust, proliferation of both alveolar macrophages and type II pneumocytes were observed. The lymph node test is rated as the most sensitive of all in vivo tests in the determination of the aggressivity of dusts and of therapeutic results. Subacute effect of mine dust on the cells and retarded toxic effect were observed. Serum and lung fluid partly or totally suppressed the toxicity of the dust temporarily. Animal tests indicate the absence of linear correlation between toxicity and quartz content, and between toxicity and fibrogeneicity.

36323 **APTIC NO. 59167**

Huebner, Robert J., Aaron E. Freeman, Carrie E. Whitmire, Paul J. Price, Johng S. Rhim, Gary J. Kelloff, Raymond V. Gilden, and Hans Meier

ENDOGENOUS AND EXOGENOUS RNA TUMOR VIRUS GENOMES IN CHEMICAL CARCINOGENESIS. *In: Environment and Cancer, Baltimore, Williams and Wilkins, 1972, p. 318-348. 84 refs. (Presented at the Symposium on Fundamental Cancer Research, 24th, 1971.)*

System studies of the role of the RNA tumor virus genome in carcinogen-induced tumors in vivo and of cell transformations in vitro are described. Studies are reviewed which indicate that embryonic mouse, rat, and hamster cells superinfected with nontransforming C-type RNA tumor viruses, and thus carrying multiple nascent oncogenes, provide highly sensitive and reproducible test systems for quantitative in vitro assay of known or suspected environmental carcinogens.

36324 **APTIC NO. 58892**

Nakajima, Taichi, Shoji Hattori, Ryuhei Tateisni, and Takeshi Horai

MORPHOLOGICAL CHANGES IN THE BRONCHIAL ALVEOLAR SYSTEM OF MICE FOLLOWING CONTINUOUS EXPOSURE TO LOW CONCENTRATIONS OF NITROGEN DIOXIDE AND CARBON MONOXIDE. *Nihon Kyobu Shikkan Gakkai Zasshi (Japan J. Thoracic Dis.), vol. 10:16-22, 1972. 8 refs. (Presented at the Japan Lung Cancer Society, Annual Meeting, 11th, 1970.)*

Inhalation of nitrogen dioxide gas for 30-45 days was found by electron microscopy to induce shortening and reduction of cilia of the ciliated epithelial cells. Edematous changes of the alveolar epithelial cells and edema of the alveolar interstitium were observed. Light microscopy showed that mice exposed to 0.5 0.8 ppm of NO2 for 1 month revealed so-called hyperplastic foci due to proliferation of epithelial cells of the peripheral bronchus. This kind of epithelial proliferation has also observed as an early change of pulmonary adenoma in mice. A finding completely identical to the hyperplastic foci in pulmonary adenoma was observed here in the lung of mice exposed to NO2. (Author abstract)

36325 **APTIC NO. 59139**

Sanguigno, N.

ETIOPATHOGENIC FACTORS IN RELATION TO THE ENVIRONMENT AND HABITS. *(I fattore de ordine etiopatogenetico in rapporto all ambiente e alle abitudini di vita). Text in Italian. Arch. Monaldi Fisiol. Nalattie Apparato Respirat., 27(5):679-684, Sept.-Oct. 1972.*

General etiopathogenetic factors involved in the action of air pollutants on the respiratory system are surveyed. Most air pollutants, generated by combustion processes in domestic heating, industries, and motor vehicles, such as smoke, soot, sulfur dioxide, formaldehyde, and acrolein, have irritating and/or toxic effect on the human organism in general, and on the respiratory system in particular, with non-specific, chronic bronchopneumopathy as the commonest consequence of the exposure to such air pollutants. Dust particles of about 20 microns are retained by the upper respiratory organs, and so are 70% of particles of 10 microns, with 30% penetrating into the tracheobronchial tract. Some 75% of 5-micron particles and about 90% of 2-micron particles clear the upper respiratory organs. Aerosols in the submicron size range pass to the respiratory bronchioles and the alveolar vessels. Larger particles are retained in the upper respiratory tract by inertial sedimentation, while smaller particles clearing the upper respiratory tract are deposited gravitationally. Bronchial lesions, a form of adaptation to air pollutants, mucous hypersecretion, and reduction of the sensitivity of the mucosa to the irritants are caused by irritating air pollutants.

36326 **APTIC NO. 59084**

Standler, Ronald B. and Bernard Vonnegut

ESTIMATED POSSIBLE EFFECTS OF AGI CLOUD SEEDING ON HUMAN HEALTH. *J. Appl. Meteorol., 11(8):1388-1391, Dec. 1972. 36 refs.*

Estimates based on information in medical and meteorological literature indicate that silver iodide in the air and precipitation does not pose a danger to people in the target area. Interviews with operators who have been seeding on a large scale for many years failed to disclose any instances of ill effects from AgI despite the much larger concentrations present near the generator. Further studies on possible hazards associated with inhalation of AgI aerosols are desirable, and more biological studies are needed to determine the effects of AgI on vegetation, fish, and other organisms. (Author abstract modified)

36327 **APTIC NO. 58669**

Szulc-Kuberska, Janina

CHOSEN PROBLEMS CONCERNING CHRONIC TRICHLOROETHYLENE POISONING. *(Zagadniena wybrane z dziedziny przewleklych przemyslowych zatruc trojchloroethylenem). Text in Polish. Folia Med Lodz., vol. 16:67-90, 1972. 51 refs.*

Fifty workers exposed to the protracted action of trichloroethylene underwent examination of auditory function, inner ear structure, and tryptophan transformation. Frequent occurrence of pseudoneurotic disorders, impairment of single cranial nerves (most often the trigeminal), and polyneuropathy were revealed. The results obtained were compared to those of a similar study 15 years ago. There were no differences. There exists a distinct correlation between the duration of work and the frequency of occurrence of clinical symptoms. Examination of the auditory and labyrinthine apparatuses revealed some perceptive deafness. Labyrinthine changes are of mixed central peripheral type. Biochemical studies revealed disorders of tryptophan metabolism, suggesting the existence of lowered activity of tryptophan pyrolase and of pyridoxine under these conditions.

36328 **APTIC NO. 58487**

Wagner, J. C.

THE SIGNIFICANCE OF ASBESTOS IN TISSUE. *Recent Results Cancer Res, vol. 39:37-46, 1972. 25 refs.*

The toxicity of various types of asbestos is discussed. The several types of asbestos are all fibrous silicates with similar properties. The major types of asbestos, chrysotile, amosite, and crocidolite, have different toxic effects. These effects include mesotheliomas, tumors, fibrosis, and carcinomas. Various epidemiological and experimental studies are described. Recent experiments are described including giving rats varying doses of chrysotile and crocidolite, inoculation with chrysotile from seven Canadian mines, inoculation with various reference samples of different types of asbestos dust, and asbestos dust inhalation. Results of these are given. All samples of asbestos produced mesotheliomas after intrapleural inoculation. Removal of oils from the asbestos samples did not remove the components producing mesotheliomas. The more finely ground samples produced more mesotheliomas, but this could have been due to factors other than particle size. Inoculation caused a high incidence of mesotheliomas, inhalation produced an excess of lung adenomas and only three mesotheliomas, two of which were after surprisingly short exposure. The difference is probably due to inhaled dust not penetrating as far as the mesothelial surface. Physical aspects of the dust which could influence toxicity are reviewed.

36329 **APTIC NO. 59263**

Zarkower, A. and W. Morges

ALTERATION IN ANTIBODY RESPONSE INDUCED BY CARBON INHALATION: A MODEL SYSTEM. *Infec. Immunity, 5(6):915-920, June 1972. 19 refs.*

The immune response in mice to antigens given by intraperitoneal, intravenous, and inhalation routes was compared in control and carbon dust-exposed mice. The most pronounced effect, a decrease in antibody-forming cells and serum agglutinin titers, was observed when the carbon-treated animals were immunized with antigens in aerosol form. Similar results were obtained when the antigens were administered by intravenous or intraperitoneal routes. In contrast, 4 days of preexposure to carbon dust increased the number of antibody-forming cells in the mediastinal lymph nodes. However, this effect was transient and was not significant when the carbon preexposure was continued for 15 days. (Author abstract)

1971

36330 **APTIC NO. 58739**

Coffin, David L.

AIR POLLUTION: PRESENT AND FUTURE THREAT TO MAN AND HIS ENVIRONMENT. *In Advances in Environmental Science and Technology. James N. Pitts, Jr. and Robert L. Metcalf (eds.), Vol. 2, New York, Wiley, 1971, p. 1-38. 110 refs.*

The sources and types of air pollution are discussed in relation to man and his environment. If factors affecting pollution from stacks and tail pipes are assumed to be equal, a number of meteorologic and geographic conditions alter the pollution in a local area: concentrations of emission sources, topography, wind velocity, wind direction, and the frequency of temperature inversions. The concentration of emission sources is a result of urbanization. The main sources of air pollutants are from the combustion of fossil fuels for heat, stationary power sources, and automobile traffic. The specific effects of air pollutants on man and his environment that are discussed include: damage to plants, human health, exacerbation of chronic disease, the etiology of acute primary lung disease, pulmonary structure, lung cancer, domestic animals, and ecological implications. Chapters on the control of air pollution, control of automobile emissions and carbon monoxide are included.

36331 **APTIC NO. 58875**

Mulay, L. Indumati, Rustum Roy, B. E. Knox, N. H. Suhr, and William E. Delaney

TRACE-METAL ANALYSIS OF CANCEROUS AND NONCANCEROUS HUMAN TISSUES. *J. Natl. Cancer Inst., 47(1):1-13, July 1971. 38 refs.*

To ascertain whether any significant differences in the concentration of trace metals exist between cancerous and noncancerous human tissues, 22 trace metals and two bulk metals were examined by emission spectrography. Both cancerous and noncancerous tissue samples were taken from the same individual, and the clinical and histopathologic information was obtained. Breast, lung, and colon cancers were studied. Copper, magnesium, manganese, and zinc content of the cancerous breast tissue was signfiicantly higher than that of the noncancerous tissue. In bronchogenic carcinoma of the lung, the iron content of the cancerous tissue was significantly lower and the zinc content significantly higher than contents in the noncancerous tissue. In adenocarcinoma of the colon, the concentration of tin was considerably lower in cancerous than noncancerous tissue. Significant differences in the concentration of selective metals were noticeable between cancerous tissues; these differences pertained to a specific type of cancer which indicates that all types of cancers cannot be grouped under one category; for interpretation, each type should be regarded as a separate entity. (Author summary modified)

36332 **APTIC NO. 59181**

Ramazzoto, Louis J. and Lawrence J. Rappaport

THE EFFECT OF NITROGEN DIOXIDE ON ALDOLASE ENZYME. *Arch. Environ. Health, vol. 22:379-380, March 1971. 6 refs.*

The effects of nitrogen dioxide on the aldolase enzyme system of the rat were investigated. In vitro studies were made by bubbling NO2 (33 ppm) directly into the homogenate of lung tissue. The rates of flow of the gas were varied at 4.0, 3.0, 2.5, and 2.0 l/min. Enzyme activity increased due to exposure of tissue to the gas. As the amount of NO2 introduced to the tissue per min was lowered, there was a decrease in the difference between exposed and nonexposed groups. Exposures at flows of less than 2.0 l/min had an insignificant effect upon enzyme activity. (Author abstract)

36333 **APTIC NO. 58604**

Wands, Ralph C., Frank G. Favorite, and Lawrence M. Roslinski

BASIS FOR ESTABLISHING GUIDES FOR SHORT-TERM EXPOSURES OF THE PUBLIC TO AIR POLLUTANTS. *Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, Aerospace Medical Research Lab. and National Academy of Sciences, Washington, D. C., Air Force Contract F33615-70-C-1046, National Academy of Sciences/Air Pollution Control Office Contract CPA-70-57, Proj. 6302, AMRL-TR-71-120, p. 215-224, Dec. 1971. (Presented at the SysteMed Corporation, Annual Conference on Environmental Toxicology, 2nd, Fairborn, Ohio, Aug. 31-Sept. 2, 1971, Paper 15.)*

NTIS, DDC: AD 751437

A summary is given of recent and current work by the Committee on Toxicology of the National Academy of Sciences-National Research Council on short-term exposures of the public to air pollutants. The goals of the committee are mentioned and short-term exposure is defined. The sources of uncertainty in using animal experiment data, types of data needed as a basis for short-term limits, and interpretation of data are reviewed.

1970

36334 **APTIC NO. 59475**

Devos, A.

AIR CONTAMINATION AND DISEASE PROBLEMS IN POULTRY. *Int. Vet. Stud. Assoc. Mag., 1970:14-15, 1970. 9 refs.*

A constant air volume was collected in poultry houses with a Casella bacteria sampler prior to and during the arrival of birds in an effort to investigate the connection between diseases of the digestive and respiratory tract, paralysis, and tumors and air contamination. A serious disease of air contamination in terms of total aerobe flora and enterobacteriaceae was observed. Various disinfection methods were then employed to eliminate the contamination. Further investigations appear necessary to arrive at a conclusion concerning the transmission of the diseases and the effectiveness of disinfection measures.

36335 **APTIC NO. 58603**

Schulte, John

THE EFFECT OF EXPOSURE TO LOW CONCENTRATIONS OF CARBON MONOXIDE. *Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, Aerospace Medical Research Lab. and Ohio State Univ., Air Force Contract F33615-70-C-1046, Proj. 6302, AMRL-TR-70-102, p. 87-91, Dec. 1970. (Presented at the SystMed Corporation, Annual Conference on Environmental Toxicology, 1st, Fairborn, Ohio, Sept. 9-11, 1970, Paper 6.)*

NTIS, DDC: AD727509

Fifty firemen were studied over 9 mo. Each one was studied four times under four different sets of exposures so that each had 5, 10, 15, and 20% carboxyhemoglobin levels. Increased COHb levels were correlated with increased arithmetic errors. Firemen with high COHb levels also had slower reading rates and more reading errors. The effect of carbon monoxide concentrations on driving ability was also studied. With COHb levels between 5 and 10% there was an increase in judgmental error. Differences in results are described, and causes for them are discussed. Causes may include stress, conditioned reflexes, and the amount of CO needed to produce a certain COHb level depending on exposure length.

1969

36336 **APTIC NO. 58655**

Hidy, George M. and James R. Brock

LUNG DEPOSITION OF AEROSOLS-A FOOTNOTE ON THE ROLE OF DIFFUSIOPHORESIS. *Environ. Sci. Technol., 3(6):563-567, June 1969. 10 refs. (Presented at the American Chemical Society, 156th Meeting, Atlantic City, N. J., Sept. 1968.)*

Diffusiophoresis is potentially more important to aerosol deposition in the lungs than thermophoresis. In this phenomenon small particles develop a drift velocity in a nonuniform gas with gradients in concentration of one or more gaseous species. The diffusion transport of water vapor, oxygen, and carbon dioxide to and from air inhaled into the lungs must involve concentration gradients of these gases. Therefore, diffusiophoresis may have an important supplemental influence on the depositional processes of aerosols in the lungs. By impaction, interception, and sedimentation, particles larger than about 1 micron in radius are trapped in the upper portions of the respiratory system while particles smaller than 0.5 micron in radius are believed to penetrate as far as the alveolar sacs before deposition by Brownian diffusion to the alveolar walls. Calculations have been carried out estimating the vapor and gas fluxes directly, instead of attempting to evaluate the concentration gradients. Comparison of these calculations with typical velocities for Brownian diffusion gives an illustration of the relevance of diffusiophoresis to aerosol deposition in the lungs. Computations show that the diffusiophoretic effect is likely to play a minor role in the behavior of aerosols in the lower lungs for sedentary conditions. In the case of particles with 0.1 micron radii or less, diffusiophoresis can at best be 10 to 15% of the diffusion speed, even for conditions of heavy exercise. The influence of deposition will be larger for the larger particles perhaps amounting to 20%. Under conditions of heavy exercise, however, the diffusiophoretic velocity can become appreciable for particles of 1 micron, with a magnitude in the order of diffusional speed.

1968

36337 **APTIC NO. 59466**

Hecko, I., J. Grunt, and J. Ambrus

THE PRINCIPLE OF HOMEOSTASIS AND THE CHANGES IN THE BLOOD PICTURE OF CHILDREN DUE TO CHANGING CONDITIONS IN THE ENVIRONMENT. *J. Hyg. Epidemiol., Microbiol., Immunol. (Prague), no. 12:488-497, 1968. 16 refs.*

Repeated hematological examinations were performed on 60 children (average age of 7 years) selected in equal numbers from town and country areas in an effort to examine the effects of changing environmental conditions on blood picture. The town children were from Bratislava and lived in the vicinity of a chemical plant; the area had high concentrations of dust, hydrogen sulfide, and sulfur dioxide. The hematological results showed no statistically significant differences between the two groups despite clearly different environmental and hygienic conditions of life in the town and country. Significant statistical differences for both groups, however, were found between some hematological values obtained after the beginning of the school and values determined before the end of the same school year. (Author summary modified)

1967

36338 **APTIC NO. 58724**

Denton, R., S. H. Hwang, W. C. Forsman, M. Litt, and C. E. Miller

VISCOELASTICITY OF MUCUS: ITS ROLE IN CILIARY TRANSPORT OF PULMONARY SECRETIONS. *Aspen Emphysema Conference, 10th, 1967, p. 287-307. 20 refs. (Also: Am. Rev. Respirat. Disease, Sept. 1968.)*

The significance of the rheological properties of biological secretions to the interpretation of physiological flow phenomena is outlined, using the mucociliary transport system of the lung airways as an example. An instrument to study the rheological properties of mucus patterned after the magnetic microrheometer was developed. A sample containing a nickel particle was contained between the poles of an electromagnet placed on the stage of an inverted microscope. When the electromagnet current was turned on, the nickel particle moved with a motion characteristic of the particular rheological properties of the sample. It was possible to quantitate results by calibrating the instrument with a Newtonian fluid of high viscosity, and using Fourier transform analysis, to put the data in a form from which quantitative conclusions may be drawn. Using this technique, one should be able to study the rheological properties of samples obtained from patients with various diseases, perhaps before and after different treatments, and to determine whether any differences can be correlated with either the viscous or elastic component of the material. Such knowledge may also lead to further understanding of mucociliary transport mechanisms. As a first step of an investigation into the fluid dynamics of mucus flow under the action of cilia, a mechanical analog of ciliary motion was constructed and used to study the resultant types of flow. The principal conclusion from this model is that the flow observed is primarily initiated by the way in which the beat of each cilium is synchronized with its neighbors. Even though the flow was undulatory, particulate material subjected to this oscillation has a net forward component along the ciliary bed.

1966

36339 **APTIC NO. 58870**

Goldwater, Leonard J., Antonio Nicolau, and S. Joao da Madeira

ABSORPTION AND EXCRETION OF MERCURY IN MAN. *Arch. Environ. Health, vol. 12:196-198, Feb. 1966. 8 refs.*

Ten men who had worked in the hat industry for 18-46 years and who showed evidence of mercurialism from mercury vapor exposure, the exposure terminating 3-6 years prior to the study, and a second group of 12 workers with no more than 3 years of hat working experience who were presumed to have no occupational exposure to mercury were given urine and blood analyses. The exposed workers had mercury in the blood, while only 25% of nonexposed workers had detectable mercury. All of the exposed group had mercury in the urine, while only three of the control group had mercury in their urine. Following occupational exposure to mercury nitrate, measurable amounts of mercury may persist in the blood and urine for as long as 6 years after exposure has ended.

1959

36340 **APTIC NO. 58704**

California Dept. of Public Health

AIR POLLUTION EFFECTS REPORTED BY CALIFORNIA RESIDENTS. *54p., 1959 (?). 5 refs.*

The effects of air pollution on the social and psychological aspects of daily living in California were investigated. A probability sample of 6939 adults were personally interviewed on the effects of air pollution on himself and his way of life. The major findings included: 45% of the adult population of the State were bothered by air pollution either at home, at work, or both; eye and nasal irritation were the most frequently reported effects; persons with chronic respiratory conditions were more likely to report sensitivity to the effects of air pollution; some Californians had given serious thought to moving or to changing jobs because of air pollution; some Californians had already moved one or more times because of air pollution, chiefly from areas in Los Angeles County; the most serious and extensive complaints concerning air pollution came from Los Angeles County. (Author summary modified)

1927

36341 **APTIC NO. 58877**

Cooke, W. E.

PULMONARY ASBESTOSIS. *Brit. Med. J., 1972:1024-1025, Dec. 3, 1927. (Presented at the British Medical Association, Annual Meeting, Edinburgh, Scotland, 1927.)*

The history of asbestos uses, its composition, and its manufacture are reviewed. Asbestos dust can cause pulmonary asbestosis. The clinical history of a woman who worked in an asbestos factory and who has asbestosis is discussed. The macroscopic appearances of the pleura, lung, and lung tissues are discussed. Fibrosis of the lungs occurred, and large solid angular particles were found.

EFFECTS-PLANTS AND LIVESTOCK

1974

36342 **APTIC NO. 59355**

Beamish, Richard J.

GROWTH AND SURVIVAL OF WHITE SUCKERS (CATOSTOMUS COMMERSONI) IN AN ACIDIFIED LAKE. *J. Fish. Res. Bd. Can., 31(1):49-54, 1974. 17 refs.*

White suckers (Catostomus commersoni) in the acidic Lumsden Lake in 1967 and 1968 exhibited reduced annual growth followed by death. The reduced growth and death appeared directly related to the low pH and not to a shortage of food caused by the decreasing pH. Examination of heavy metals, in the lake from precipitation fallout showed that only zinc levels (24-33 micrograms/l) were sufficiently high to be potentially hazardous to fish. The heavy metal, although not of sufficient magnitude to be considered the principle stressing agent, may have acted synergistically with the acid, influencing its concentration. (Author abstract modified)

36343 **APTIC NO. 58507**

Kay, E.

AN INQUIRY INTO THE DISTRIBUTION OF FLUORIDE IN THE ENVIRONMENT OF GARRISON, MONTANA. *Fluoride, 7(1):7-31, Jan. 1974. 31 refs.*

In the fall of 1971 and 1972, the extent and severity of fluoride contamination in the vicinity of Garrison, Montana was determined. Assays of the fluoride content of indigenous flora and fauna were utilized to establish the effectiveness of the air pollution control equipment of a fluoride-emitting industrial facility. Vegetation samples included forage, shrubs, coniferous and deciduous tree species, as well as various species of small mammals in a directional pattern throughout the study area were analyzed for fluoride and compared with control samples collected throughout western Montana. Analysis by individual species allowed comparison of the ratio of fluoride accumulation between species. Fluoride levels in vegetation and small mammals were also correlated. Isopol maps of fluoride concentrations in vegetation were constructed. Wide differences between different species were observed. Fluoride concentrations in different species were compared and presented graphically. (Author abstract)

36344 **APTIC NO. 58506**

Keller, Th.

TRANSLOCATION OF FLUORIDE IN WOODY PLANTS. *Fluoride, 7(1):31-35, Jan. 1974. 5 refs.*

Foliage of different species of forest trees was analyzed for its fluoride content. The foliage of plants which had been exposed to fluoride exhalates of an aluminum smelter for one to many years was analyzed after it had been allowed to flush and develop in pure air. All samples of the foliage of trees near the factory had increased fluoride content in dry matter as compared to controls. The foliage near the smelter contained 11-136 ppm F in dry matter, whereas controls contained 3-14 ppm. The level of fluoride in first leaves formed in the spring was higher than that in foliage formed later in the year, a fact indicative of depletion of reserves. New foliage of deciduous trees which had been exposed to fluoride fumes in winter exclusively also contained increased amounts of fluoride, a fact which indicates mobilization of fluoride entering the tree via the bark. These data prove that fluoride is being translocated in woody plants. (Author abstract modified)

36345 **APTIC NO. 58471**

Miller, V. L., R. K. Howell, and B. E. Caldwell

RELATIVE SENSITIVITY OF SOYBEAN GENOTYPES TO OZONE AND SULFUR DIOXIDE. *J. Environ. Quality, 3(1):35-37, Jan.-March 1974. 6 refs.*

Twenty-one soybean genotypes were evaluated for resistance to ozone and 19 genotypes for resistance to sulfur dioxide in a greenhouse and a growth chamber. The genotype PI 157474 was most resistant to ozone, but ranked 14 in resistance to SO2. York was most resistant to SO2 and ranked fourth when subjected to ozone. Peking was least resistant to both phytotoxicants. Experimental conditions necessary to investigate inheritance of resistance to ozone were determined by fumigating soybean plants equally spaced in a growth chamber. Relative sensitivity of each of the parents at several stages of foliar development must be established before classifying the progeny. (Author abstract)

36346 **APTIC NO. 58952**

Ohmoto, Shiko and Tetsuji Okabe

ENVIRONMENTAL MEASUREMENT TECHNOLOGY BY AERIAL PHOTOGRAPHY. *(Koku satsuei ni yoru kankyo sokutei gijutsu). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(1):95-101, Jan. 1974.*

A method was developed for estimating the degree of activity of vegetation affected by air pollution by aerial photography. The method utilizes a multi-spectral band camera with four filters; blue, green, red, and infrared. First tree classifications must be determined to know the activity by effective combinations of spectrum bands. One of two methods of differentiating the colors is the use of digital color data concentration meter, and the other is by a color viewer, by creating false color by the combination of natural colors with the three colors and infrared. The digital color concentration meter can classify colors into 12 levels. To obtain accurate differentiation, a special enlargement equipment for a digital color data system was constructed, and 30-140 times enlargement became possible. To eliminate the reflection differences of infrared caused by the various heights of the sun, trees, and tree species, adjustments were made. The process includes aerial photography by a multiband camera, development of the film, dryer, the color data system, color viewer or analysis model, pattern analysis, and future prediction data by calculation by computer. Using this method, the growth activities of vegetation in Chiba Prefecture were investigated.

36347 **APTIC NO. 58802**

Williams, Carolyn

THE ACCUMULATION OF LEAD IN SOILS AND HERBAGE AT ROTHAMSTED EXPERIMENTAL STATION. *J. Agr. Sci., 82(1):189-192, Feb. 1974. 8 refs.*

To measure the accumulation of lead in an area 42 km from London and within 2 km of the A5, A6, and M1 trunk roads, the Pb contents of topsoils collected from sites at Rothamsted Experimental Station since 1881 have been determined. From 1883 to 1972 the increases ranged from 17 to 46% but because of the variable Pb contents within fields, the absolute rate of accumulation is difficult to determine. The Pb content of herbage harvested twice yearly since 1920 haas not increased noticeably. The Pb contents of the herbage samples did not reflect the introduction of antiknock additives (tetraethyl Pb) to gasoline, in the 1930 s, or to increased motor traffic. Increases in the Pb content of the herbage were reflected by increased titanium contents, and may therefore have arisen from contamination by dust. The effect is more noticeable in the second harvest, but it cannot be related in any way to motor traffic, as it is equally apparent in both the 1920-23 and 1972 samples.

1973

36348 **APTIC NO. 59150**

Cormis, Louis de

EFFECTS OF SULFUROUS AIR POLLUTION ON THE VEGETATION. *(Effets de la pollution soufre sur les vegetaux.). Text in French. Annales des Mines (Paris), 1973:23-32, Nov.-Dec. 1973.*

The effects of sulfur dioxide on plants and on crops are surveyed. Sulfur dioxide present in the air even in rather low concentrations causes interneural necrosis of ivory or light brown color on the leaves. With SO2 not present permanently in the air, the necrosis fails to progress. Sulfur dioxide is absorbed by plants primarily through the stomata whose closure is delayed when SO2 is present in a certain, species-specific, critical concentration. Most plants are sensitive to SO2 during spring than they are during summer and fall, and they are more sensitive during the daytime than they are at night. Such sensitive species as Stellaria media, Anagallis arvensis, Plantago lanceolata, Oxalis spp., and Pteris aquilina are suitable as test plants. Production losses in agriculture are mostly due to the increased sensitivity of leguminous plants and Graminea, as well to the increased sensitivity of vine during ripening. While green spaces exert a certain filtration effect with respect to SO2, their possibilities are limited as regards the absorption of SO2, and their value lies primarily in their altering the surface roughness and thus improving the dispersion of the pollutants.

36349 **APTIC NO. 59298**

Crudgington, D. R., J. Markland, and J. Vallance

THE UPTAKE OF LEAD BY VEGETABLES FROM SOIL. *J. Ass. Pub. Anal., vol. 11:120-126, Dec. 1973. 2 refs.*

Determinations were made for the lead content of vegetables and soil in the Matlock area of Derbyshire in an effort to assess the extent of Pb uptake from the soil; soil concentrations of zinc and cadmium were also investigated. Although there was evidence of Pb in whole samples of root vegetables (difficult to wash free of soil), the peeled roots contained very little metal, and the results afforded no evidence of Pb uptake from the soil. The atmosphere was clearly a source of Pb as demonstrated by the tops of gooseberries and blackcurrants and their washings; tests on outer leaves of lettuce and brassicas also pointed to airborne Pb. A Pb-processing works was located near the test area. The Pb, Zn, and Cd concentrations for a variety of garden soils were also investigated and recorded.

36350 **APTIC NO. 58810**

Evans, Lance S. and Irwin P. Ting

OZONE-INDUCED MEMBRANE PERMEABILITY CHANGES. *Am. J. Botany, 60(2):155-162, 1973. 27 refs.*

The effect of 0.5 ppm ozone for 0.5-1 hr on plant cell membrane permeability was ascertained. Permeabilities to both water and solutes were estimated by measuring leaf disc weight changes and following tritiated water and rubidium-86 fluxes. Measurements were made immediately and 24 hr after O3 exposure. The reflection of coefficient, an index solute permeability, decreased in O3 ozone-treated primary leaves of pinto bean. The latter indicates an increase in membrane solute permeability or internal solute leakage. Water and tritiated water flux estimates both indicated a decrease in membrane permeability to water; both the hydraulic conductivity and the water diffusional coefficient apparently decreased, an anomaly which is discussed. These data indicate that ozone has a direct effect on membrane function by altering permeability characteristics. Thus, cell membranes are primary target sites for ozone injury. (Author abstract)

36351 **APTIC NO. 59213**

Heggestad, H. E.

PHOTOCHEMICAL AIR POLLUTION INJURY TO POTATOES IN THE ATLANTIC COASTAL STATES. *Amer. Potato J., 50(9):315-328, 1973. 9 refs.*

Photochemical oxidants, primarily ozone, cause severe injury to potatoes in the form of premature senescence of leaves, death of the plants, and reduced field of tubers. Ozone produces leaf injuries similar to those observed in fields under some controlled conditions. Studies were initiated in 1969 comparing growth of eight varieties in greenhouses with carbon-filtered and unfiltered air, and yields were reduced as much as 50% in unfiltered air. Tolerant varieties produced about the same yields in both environments, but their yields in filtered air tended to be lower than for sensitive varieties. The leaf response of 55 varieties to ozone and to pollutants in unfiltered air were assessed in 1972. A summary of four years of oxidant data at Beltsville, Md. is also provided. Severe leaf injury and yield loss (about 50%) were noted for some potato varieties on the Eastern Shore of Virginia in 1971 and were attributed primarily to oxidant air pollutants. Oxidant levels for the area reached about the same maximum levels during 1971 and 1972. (Author abstract modified)

36352 **APTIC NO. 58792**

Honma, Shin, Keitaro Nakatani, Ryoitsu Sato, and Hiroshi Yawata

MEASUREMENTS OF HEAVY METAL CONTENT IN THE 1972 CROP OF UNPOLISHED RICE IN THE KOSAKA TOWNSHIP. *(Kosakacho 47-nen san genmaichu no jukinzoku ganyuritsu sokutei kekka ni tsuite). Text in Japanese. Chu-tsu Byoin Iho (Bull. Chu-tsu Hosp.) (Akita), 14(7):80-81, 1973.*

The 1972 crop of unpolished rice in Kosaka-cho was examined; the maximum cadmium content among 77 samples was 0.780 ppm, the minimum was 0.068 ppm, and the average was 0.251 ppm. In the Hosokoshi area of the town where the mines are located, the maximum measurement among 37 samples was 0.72 ppm, minimum 120 ppm, and the average was 0.30 ppm. Out of 77 samples, 9 (11.7%) had more than 0.4 ppm in the total area, and out of 37 samples of the Hosokoshi area, 6 samples (16.2%) had more than 0.4 ppm of Cd.

36353 **APTIC NO. 58420**

Honma, Shin, Keitaro Nakatani, Ryoitsu Sato, and Hideaki Kawanobe

REPORT ON THE INVESTIGATION OF HEAVY METAL POLLUTION IN KOSAKA TOWNSHIP, AKITA PREFECTURE. *(Akita-ken Kosaka-cho ni okeru jukinzoku-to no osen chosa hokokusho). Text in Japanese. Chu-tsu Byoin Iho (Bull. Chu-tsu Hosp.) (Akita), 14(7):56-72, 1973.*

The soil, unpolished rice, and vegetation in two districts of the Kosaka township, Akita prefecture were analyzed in December 1971 to see the metal content. Five g of dry soil and 10g of dry plants were dissolved by nitric acid and perchloric acid, and the solutions were analyzed by atomic absorption spectrophotometry. Ten g of unpolished rice were dissolved in the same way and extracted by MIBK and atomic absorption spectrophotometry was applied. Cadmium, zinc, lead, copper and manganese were analyzed. High concentrations of Cd, Zn, Pb, and Cu were found in the soil; the highest Cd count downstream was 14.5 ppm. The rice paddies and dry field had approximately 7.5 ppm, and the mountain soil had 6.9 ppm. Zinc, Pb, and Cu concentration distributions showed the same tendency, with the maximum of 1000 ppm for Zn and Pb. The Mn concentration was higher in the upper stream. In green grass in summer 1000 ppm Cd and 2000 ppm Zn had been found, but the dead grass of winter evidently contains less metals: Cd level was 87.5 ppm and Zn was 539 ppm. Twenty samples of unpolished rice were examined and an average of 0.36 ppm of Cd was found; eight samples had more than 0.4 ppm. The Cd level in small beans was 0.29 ppm, potatoes, 0.59 ppm, celery, 8.5 ppm, and cabbage 0.5 ppm. The Pb and Cu contents were also relatively high in celery.

36354 **APTIC NO. 58789**

Honma, Shin

CADMIUM CONTENT IN THE SOIL AND PLANTS IN THE VICINITY OF KOSAKA REFINERY. *(Kosaka seirensho shuhen no dojo narabi ni shokubutsu-taichu no kadomiumu ganyuryo ni tsuite). Text in Japanese. Chu-tsu Byoin Iho (Bull. Chu-tsu Hosp.) (Akita), 14(7):73-74, 1973.*

The cadmium content in the plants and soil near the Kosaka metal refinery were investigated. The area is in no way polluted by industrial water; it does have air pollution. Within the area of samplings, the soil was polluted up to 6 km upstream of the refinery, and all the samplings taken in the downstream direction contained more than 1 ppm of cadmium. The edible wild plants that are used by the people of area for food contained from 0.62 to 13.4 ppm of cadmium; of the five specimens, the lily contained the highest concentration of Cd.

36355 **APTIC NO. 58946**

Houston, D. B. and G. R. Stairs

GENETIC CONTROL OF SULFUR DIOXIDE AND OZONE TOLERANCE IN EASTERN WHITE PINE. *Forest Sci., 19(4):267-271, Dec. 1973. 17 refs.*

Clonal repeatability analyses were performed to obtain an estimate of the upper limit of genetic control for tolerance and Eastern White Pine (Pinus strobus) to sulfur dioxide and ozone in greenhouse fumigation chambers. Tolerant and sensitive clones were fumigated for 6 hr with a mixture of 2.5 pphm SO2 and 5 pphm O3, and response was judged by needle elongation and two indices of direct needle damage. Visible injury was defined as tip necrosis and/or distinct necrotic banding. All of the sensitive clones included in the trials were injured, while none of the tolerant clones developed visible symptoms. Differences in needle elongation between clones within tolerant and sensitive groups suggested that tolerance may function over a wide range of response. Physiological response as characterized by visible damage appeared to operate on the basis of a threshold mechanism, while tolerance of continuing metabolic processes to pollution injury seemed to operate on a more continuous scale. Repeatability estimates based on needle elongation values averaged 0.511; those derived from indices of direct needle damage averaged 0.799 and 0.818. (Author abstract modified)

36356 **APTIC NO. 59322**

Jensen, Keith F.

RESPONSE OF NINE FOREST TREE SPECIES TO CHRONIC OZONE FUMIGATION. *Plant Disease Reptr., 57(11):914-917, Nov. 1973. 7 refs.*

Yellow poplar, green ash, white ash, sycamore, red maple, silver maple, sugar maple, black walnut, and European black alder seedlings were fumigated with 30 pphm ozone for 5 mo. Significant reductions in growth of sycamore, sugar maple, and silver maple were found. The fumigated seedlings also tended to lose their leaves sooner than the unfumigated seedlings. The relationship between these findings and sensitivity classifications based on symptom development are discussed. (Author abstract)

36357 **APTIC NO. 59007**

Kato, Tatsuo and Susumu Tanaka

STUDIES ON THE CAUSES FOR DYING CRYPTOMERIAS. *(Sugikare gensho no genin kenkyu ni tsuite). Text in Japanese. Preprint, Japan Society for Safety Engineering, 1973. (Presented at the Japan Society for Safety Engineering, Seminar on Safety Engineering, 6th, Tokyo, Japan, Dec. 6-7, 1973.)*

Prevalence of tree damage, especially on cryptomeria, became conspicuous in the Toyama city suburbs between 1965 and 1970. Investigations were made for three years between 1970 and 1973 for the causes of tree damage. An area of approximately 10 sq km was divided into 1 sq km mesh, and the tree vitality was checked for each tree. The damages in some areas were mixed and in some areas group damages were noted. The trees with most advanced stage of damages were invariably infested by insects. Air pollution was investigated with regard to the total area, and especially on the direct lines between pollution sources (thermal power plant and industries) and the areas of concentrated damage. In the direct line from the thermal power plant to the forest, there were peaks of high sulfur dioxide concentration of over 0.05 ppm at 3 and 8 km. With such high concentrations, the relationship with tree deaths was possible. Direct effects may not exist, but it was clear that air pollution caused weakening of the trees and indirectly caused the infestation of insects. Automobile exhausts effects were investigated by measuring carbon monoxide, but there was no apparent effect.

36358 **APTIC NO. 58381**

Lisicky, Mikulas

REMARKS ON THE INFLUENCE OF FLUORINE EXHALATIONS UPON THE MOLLUSKS IN THE SURROUNDINGS OF ZLAR NAD HRONOM. *(Bermerkungen zur Auswirking der Fluorexhalationen auf die Malakofauna in der Umgebung von Zlar nad Hronom). Text in German. Biologia, 28(11):919-924, 1973. 7 refs.*

Seventeen localities in the area contaminated by fluorine and its immediate vicinity were investigated. The malacocenoses in stagnant water and in the forest were most injured. Two hypotheses concerning the possible influence of hydrogen fluoride on the water-mollusks are advanced: direct effect, i.e., corrosion of the conch; and indirect effect-the HF blocks the calcium and the only way out for the snails is to gnaw the conches. In the contaminated area the malacocenoses trend to show high dominance of one euryoecic species. (Author abstract)

36359 **APTIC NO. 58322**

Little, P.

A STUDY OF HEAVY METAL CONTAMINATION OF LEAF SURFACES. *Environ. Pollut., 5(3):159-172, 1973. 16 refs.*

Leaves of Ulmus glabra, Crataegus monogyna, Salix alba, and Quercus robur which were heavily contaminated with aerial fallout of zinc, lead, and cadmium were subjected to several washing and extraction procedures. Large proportions of the metal burdens were present as superficial, water-soluble, and insoluble deposits which could be removed by washing. Distribution of metals on and in the leaves varied significantly between different species. Each metal was distributed differently within the leaves of any one species. The results are discussed in relation to leaf cuticle structure, foliar-absorption, and uptake of metals from the soil. The very low proportions of metals released from leaves by boiling suggest that hardly any metal is likely to be present in the leaves which may induce metabolic toxicity. The uptake of metals by the deeper roots of trees may also be very slight based on concentrations of Zn which fall off so rapidly down the soil profile. These findings may explain why concentrations of up to 9000 ppm Zn in Elm leaves are not accompanied by symptoms of toxicity. The significance of heavy fallout may be a great importance to shallower rooting herbaceous species. (Author abstract modified)

36360 **APTIC NO. 59003**

Matsuoka, Yoshihiro, Tsuyoshi Takasaki, Masaki Morikawa, Koji Shiratori, and Sadao Omichi

INVESTIGATION OF PHOTOCHEMICAL AIR POLLUTION DAMAGE TO PLANTS USING FILTERED AIR CHAMBER. *(Kuki joka-ho ni yoru shokubutsu no taiki osen higai no kensaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):539, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 265.)*

To obtain more accurate results for the epidemiological study of air pollution damages of produce, a filtered air chamber was devised. The chamber is made of glass and translucent phylon, with a suction duct taking in the outside air through a filter of activated carbon and manganese dioxide, eliminating oxidants (ozone) up to 88% and sulfur oxides up to 90%. The light, ventilation, temperature, and humidity are controlled and plants can be grown either directly or in pots. For comparison, a similar chamber with identical structure and ventilation conditions but without the filter was constructed. Tobacco, spinach, and taro potatoes grown out of doors and in the unfiltered chamber showed damages of O3 on July 31, Aug. 4, and Aug. 9, with clear and characteristic symptoms. Those were the day or days after a high oxidant concentration including some photochemical phenomena. The plants grown in the filtered air chamber showed no sign of damage. The external appearances and microscopic study of tissues agreed with the known damages by O3. The taro potatoes which were introduced to special taro virus showed no special relationship with the pollution. Incidents of damages of produce which have frequently occurred in Chiba prefecture in recent years were mostly caused by O3.

36361 **APTIC NO. 59288**

Matsuoka, Yoshihiro, Tsuyoshi Takasaki, and Osamu Udagawa

THE RELATIONS BETWEEN ATMOSPHERIC SULFUR DIOXIDE AND ACCUMULATED SULFUR IN FOLIAGE. *(Shokubatsu yochu ni shuseki suru io seibun to taikichu no aryusan gasu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):538, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 264.)*

The cumulative effects of low concentrations of sulfur dioxide, which are often not visible in plants, were measured by sulfur accumulation measurements in leaves. Potted pear seedlings were exposed to a low concentration (0.15-1.20 ppm) of SO2 for 8 hr a day, up to 400 hrs. The results showed that the total S amount in leaves increased by exposure, but nonsoluble to S content in leaves did not show any difference from the control group; they were within the range of 61-29 mg/100 g. Sulfur absorbed in the form of SO2 gas was deposited in leaves in soluble form. When leaves are exposed to the same concentration of gases but for different lengths of time, the absorption rate decreased for each longer exposure time. When the total exposure concentration remained the same, the higher the concentration and the shorter the exposure time, the accumulation quantity was smaller. The lower the concentration, the greater the cumulative amount of S. The absorption speed is higher when concentration is higher.

36362 **APTIC NO. 58775**

Mutsuura, Tsutomu

INJURY BY PHOTOCHEMICAL SMOG AS OBSERVED AND REFLECTED ON PLANT IN YOKOHOMA CITY. *(Yokohama-shi ni okeru kokagaku sumoggu ni yoru shokubutsu nasakubustsu higai ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Polluton), 8(3):544, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 270.)*

Plant and produce damages by air pollution were investigated at 30 locations in Yokohama between April and October 1972 on 3575 specimens; 157 samples showed some form of damages. Red beets (69 samples) had 45.5% damage rate; 30 spinach samples had 24.6% damages; 12 radish samples had 13.3% damages. Of 49 species, 14 had damages. Other damaged produce included turnips, Chinese cabbage, scallions, green onions, soy beans, and other green vegetables. These investigations were made on days of high oxygen concentrations ranging between 0.17 and 0.37 ppm. The effectiveness of fudanso (red beet) as a plant indicator was examined. The seeds were planted on July 25, and investigations were made between Aug. 20 and Oct. 20, and 60 spots covering 3.3 sq m. Six inspections were made on 315 samples, of which 98 showed some form of damages (31.1%) ranging from silvering on the back of the leaves to necrosis on both sides of leaves. Red beet is highly susceptible to photochemical smogs, showing various types of damages by ozone and peroxyacetyl nitrate on the same specimens. Being a biennial plant, it permits a long-term observation.

36363 **APTIC NO. 59327**

Nakamura, Akira, Shinichi Chiyo, and Makoto Yao

ON SULFUR OXIDES AIR POLLUTION IN TOMAKOMAI, KOKKAIDO. *(Hokkaido Tomakomai chiku ni okeru io sankabutsu osen ni tsuite (daiippo)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):494, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 224.)*

The Tomakomai industrial site at present emits about 6600 N cu m/hr of sulfur oxides from its paper industries and thermal power plants. Further development of petroleum refining, petroleum chemical, and electric power plants in the eastern development site will increase the emissions. In order to control the further damages of valuable, rare plants in the eastern area, the sulfur content in plant leaves were measured. Samples of oak, Japanese oak, white birch, sage brush and some others were taken in July, August, and early September; they were washed, dried, and crushed, and the total sulfur and soluble sulfur in particles smaller than 40 mesh were quantitated by the barium chloride weight method. The patterns of SOx concentration in the air and soluble sulfur in leaves had a definite realtionship, though the soil sulfur content and the weather must be taken into consideration before using those plants as air pollution indicators. At present, sage brush sampled in East Tomakomai has 0.05-0.08% of soluble sulfur; but in Tomakomai and North Tomakomai, the content ranges 0.25-0.5%. In these areas, visible damages of azalea are noted and in one area, the plant growth is impaired by fluorides. The intake of soluble sulfur in plants is lower in these areas in proportion to the SOx concentration in the air.

36364 **APTIC NO. 58578**

Nakamura, Hiraku and Shoichi Matsunaka

STUDIES ON INDICATOR PLANTS FOR MONITORING OF AIR POLLUTION (I). MORNING GLORY AS A PHOTOCHEMICAL OXIDANT INDICATOR. *(Taiki osen kanshi-yo shihyo shokubutsu ni kansuru kenkyu (I), kokaguka okishidanto ni taisuru asagao no shihyosei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):307, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 57.)*

In 1972, 20 species of morning glories were used as photochemical oxidant indicators in a natural light gloss cabinet with an exposure device. The same species were planted again in May 1973, and they were exposed to natural photochemical oxidants in July and August when the level of oxidants rose to 0.13 ppm 0.18 ppm on five occasions. For the 1972 exposure tests, the species Heavenly Blue showed the greatest susceptibility, and the rest less sensitive; Purple Lion showed an especially, strong resistance. The five natural oxidant exposures showed a similar result. Heavenly Blue and Scarlet O Hara showed the greatest susceptibility and others showed less. Small species were generally less sensitive. Purple Lion was extremely healthy and showed no damage. The damages appeared first in white spots, which developed into necrosis.

36365 **APTIC NO. 58581**

Nouchi, Isamu, Takeshi Ohashi, and Toshio Odaira

THE EFFECTS OF AIR POLLUTANTS ON VEGETATION - THE EFFECTS OF OZONE ON NUCLEIC ACID AND PROTEIN. *(Taiki osen no shokubutsu ni oyobosu eikyo; kakusan, tanpakushitsu e no ozon no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):307, Oct, 1973. (Presented at the*

Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 58.)

How ozone affects the nucleic acid and protein in plant leaves was investigated. A potted cherry tree was exposed to 15 ppm O3 gas for 6 hr each during the daylight hours in a exposure chamber, and the amounts of nucleic acid and protein during the exposure treatment were quantified and compared with those of the control plant. After 9 hr of exposure, the leaves began to show numerous red-brown spots, and at about the same time, the amount of nucleic acid and protein began to drop sharply. Nucleic acid dropped to 64% of the normal amount in 12 hr and protein dropped to 60% in 12 hr.

36366 **APTIC NO. 59271**

Nouchi, Isamu, Toshio Odaira, and Tadashi Sawada

INFLUENCE OF AIR POLLUTANTS ON PLANT PIGMENTS. *(Taiki osenshitsu no shokubutsu shikiso e no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):309, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 59.)*

The changes in chlorophyll and carotenoid of plants exposed to ozone and sulfur dioxide are reported, after experimental exposures. Potted kidney beans were exposed to 15 pphm of ozone and 45 ppm of SO2; O3 concentration was continuously measured by chemiluminescence and electroconductivity automatic meters. Chlorophyll was extracted by 80% acetone, centrifugally separated, and measured by spectrophotometry. Carotenoid was extracted by methanol and petroleum benzene, separated into the ethanol layer and the benzene layer, the benzene layer being carotene. Carotene and xanthopyll were extracted and measured by spectrophotometry. The result showed that the total chlorophyll of the control group was 1.711 mg/g and the exposed group, 1.512 mg/g; the ratio of chlorophyll d/b was 3.31 for the control group and 1.65 for the exposed group. Carotenoid quantity showed almost no change; but the ratio of xanthopyll/carotene tended to increase.

36367 **APTIC NO. 59162**

Ormrod, D. P., N. O. Adedipe, and G. Hofstra

OZONE EFFECTS ON GROWTH OF RADISH PLANTS AS INFLUENCED BY NITROGEN AND PHOSPHORUS NUTRITION AND BY TEMPERATURE. *Plant Soil, 39(2):437-439, Oct. 1973. 9 refs.*

Raphanus sativus L. (radish) plants were grown in sand culture at two temperatures and fed with nutrient solutions containing relatively low or high levels of either nitrogen or phosphorus and were then exposed at the four-leaf stage to 25 pphm of ozone for 4 hr. Ozone treatments resulted in decreased dry weight of low and high-N plants at both temperatures and of low and high-P plants only at the lower temperature. Air pollutant growth reduction was not necessarily accentuated by luxuriant growth resulting from the high nutritional status. Responses to the nutrition of specific mineral nutrients appeared to depend on the modifying effect of temperature. (Author abstract modified)

36368 **APTIC NO. 58777**

Oshina, Tatsuo, Ryuichi Sugai, Yoshimaru Fujieda, Takaaki Yanaka, and Nobuo Shibuta

FLUORIDE POLLUTION ON PLANTS IN AREA NEAR AN ALUMINUM FACTORY. *(Arumi seiren kojo shunhen ni okeru fukkabutsu ni yoru nosakubutsu osen). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):543, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 269.)*

Fluoride accumulation in produce was examined in area near an aluminum refining plant to obtain basic data for the health care of residents in the area. The relationship between F accumulation in produce with the distance and direction from the emission source, the species of produce, and the degree of air pollution were examined. Edible parts of turnip, eggplant, Chinese cabbage, potatoes, spinach, green scallions, cucumbers, and some of their leaves were checked at various distances and directions from the emission source; the area was divided by environmental quality classifications and the F content in the leaves and produce were examined. The measurements were taken by the ion electrode method after burning and distillation of the specimens. Fruit and root vegetables did not have high accumulation at any location, but the leaves had high F content even at a distance of 5 km, compared to the control area. When not taking the wind direction into consideration, the F content varied by the distance but lacked significance statistically. When studied by air quality classifications, the statistics showed a clear and significant relationship between F accumulation and the environment.

36369 **APTIC NO. 58772**

Ota, Yasuo, Hiraku Nakamura, and Saburo Shibukawa

AN INVESTIGATION ON INJURY TO PLANTS FROM PAN-LIKE AIR POLLUTION IN SAITAMA PREFECTURE. *(Saitama-kenka no taiki osen ni yoru shokubutsu higai ni tsuite--toku ni PAN ni yoru to omowareru higai). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):545, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973. Paper 271.)*

The damages of Saita prefecture s agricultural produce by photochemical smogs this year show a clearly different type from the previously known ozone damages. Several lettuce farms, a green vegetable patch, and one spinach patch had this type of damage, while adjacent farms showed damages from orainary O3, or no damage at all. Damage appears as shiny spots on the backs of the leaves; in light cases, the color is silvery, and in more serious cases the color is golden or brown, and the spots are irregularly shaped and appear between veins. In more progressed cases, the shiny spots turn a brown-copper color and some of them develop into necrosis. In this case, damages may extend to the upper surfaces. These damages may have been caused by peroxyacetyl nitrate.

36370 **APTIC NO. 58779**

Sawada, Tadashi, Tetsuto Komeiji, Isamu Nouchi, Takeshi Ohashi, and Toshio Odaira

DISCUSSION OF MORNING GLORY AS OXIDANT INDEX. *(Asagao no kishidanto (Ox) shikyosei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):541, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 267.)*

As a study for examining morning glory s susceptibility as a plant indicator, the conditions of damages on leaves were examined at various parts of Tokyo. The degrees of damages were classified into four categories: light damages which do not produce visible sign immediately, but chlorosis or discoloration appear after a period of time; medium damages in which the day after the exposure to oxidant produces an oily appearance and then white spots in one or two days; serious damages in which oily spots appear between veins immediately after the exposure, and in one or two days, they turn yellow-white, and black mottling also occurs; and a different type of damage in which silvery, elongated spots appear on the back of relatively young leaves along the veins. This last type may be the result of peroxyacetyl nitrate, but it has not been confirmed. The positions of leaves have no relative to susceptiblility to ozone, and the limits of susceptibility is about 15 days. The first three types of damages appear between June and September, and the last appear between May and July in Tokyo. Damages occur when the oxidant level is more than 15 pphm, and the length of exposure more then 2 hr. The mimimum damage-producing cumulative oxidants is 80 pphm/hr (based on the cumulative values of 9-16 hours).

36371 **APTIC NO. 58948**

Shacklette, Hansford T. and Jon J. Connor

AIRBORNE CHEMICAL ELEMENTS IN SPANISH MOSS. STATISTICAL STUDIES IN THE FIELD GEOCHEMISTRY. *Geol. Survey. Prof. Paper, no. 574E:1- 50, 1973, 50p. 44 refs.*

GPO

The epiphyte Spanish moss (Tillandsia usneoides L.) collected from its geographic range in the southern United States, was analyzed for 38 chemical elements in 123 samples. Sample analyses for rural, residential, highway, and industrial locations reflected significant differences in concentrations of metals. Samples from industrial and highway locations were characterized as containing greater-than-average amounts of arsenic, cadmium, chromium, cobalt, copper, lead, nickel, and vanadium; high levels of lead found in some samples from highway locations were especially noteworthy. Many samples from sites near the seashore contained greater-than-average amounts of sodium that is thought to have been derived from ocean spray. Samples from rural locations commonly contained low concentrations of the metals usually associated with industrial or urban activity, but many contained large amounts of the elements that ordinarily constitute soil dust. Four of six samples containing detectable amounts of tin were collected within 50 mi of the only tin smelter in the United States, suggesting tha elemental analyses of Spanish moss samples can provide an economical and rapid method of estimating the kind and relative degree of local atmospheric metal pollution. (Author abstract modified)

36372 **APTIC NO. 58771**

Shibukawa, Saburo and Yasuo Ota

EFFECT OF CHEMICAL (BENZIMIDAZOLE, THIOPHANATE METHYL AND POTASSIUM) IN REDUCING OZONE INJURY TO VEGETABLE CROPS. *(Nosakubutsu no ozon shogai in taisuru kagaku yakuzai no koka ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):546, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 272.)*

Following the previous report on the effect of methyl thiophanate for reducing the damages of photochemical smon on agricultural produce, effective concentrations and time factors were studied, and the results were compared with that of benzimidazole. Spinach and radish were grown in pots, and 21, 11, 6, and 3 days prior to ozone exposure tests, 6.25-100 micrograms of benzimidazole and 77.5-310 micrograms of methyl thiophanate solutions were injected into the various pot soils. Exposure to 0.25 ppm O3 was given for four hours to spinach and for 2.5 hours to radish. In all cases, benzimidazole showed a remarkable effect on reducing the damages of O3, especailly when injected 5-11 days prior to the exposure. Methyl thiophanate was very effect for radish but had no effect on spinach. Whether this was due to an insufficient amount of chemical or due to its selectivity is not clear at this stage of experiments.

36373 **APTIC NO. 58776**

Shibukawa, Saburo, Zenichi Kawase, Masugi Arai, and Yasuo Yoshida

SURVEY OF AIR POLLUTION INDICATED BY PLANTS (I). *(Shihyo shokubutsu ni yoru taiki osen chosa (daiippo)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):542, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 268.)*

The state of photochemical smog was investigated in southern Saitama prefecture by plant indicators. Two types of morning glory, two species of coxcomb, scallions, and leaves of zelkova, gingko, plane, Himalayan cedar, and spindle tree were studied at 41 locations. Generally, damages were prevalent in southwest of the prefecture, which agreed with the smog warnings geographically; however, high oxidant counts did not necessarily produce damages, or agree with the degree of damages. The oxidant level of May 13 ranged between 0.08 and 0.18 ppm at various locations, and light to heavy chlorosis appeared on the Heavenly Blue species of morning glory, and heavy damages occurred on scallions. The spots of the damage and the direction of the wind were reversed in the case of scallions.

36374 **APTIC NO. 59284**

Taniyama, Tetsuro and Kazuo Sawanaka

EFFECT OF THE AIR POLLUTION IN YOKKAICHI AREA ON THE DRY MATTER AND GRAIN PRODUCTION OF RICE PLANT. *(Yokkaichi ni okeru taiki osen ga suito no kanbutsu ni oyobusu eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):306, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 56.)*

The damages of agricultural produce by sulfur dioxide pollution and the resultant harvest decrease were investigated by experimental exposures. Potted rice plants were placed in groups, in Yokkaichi and in a lightly polluted area of Tsu. A close relationship between the level of sulfur dioxide and the amount of rice harvest was discovered. There were no visible damages on the plants themselves; therefore, the decrease of harvest may be regarded as the result of invisible damage of pollution. Based on this finding, the records of the past 25 years of harvests in the Yokkaichi area and the Tsu area were statistically compared. With the development of the new industrial complex in Yokkaichi, the amount of rice harvest began to decrease compared to the average of the Mie prefecture; the decrease is still continuing. The ratio of harvest decrease and the ratio of the cases of Yokkaichi asthma (new patients) are also closely related.

36375 **APTIC NO. 58942**

Tomiyaga, Yayoe, Takeshi Nozaki, Toshio Miyamoto, Eiji Ebisawa, and Katsuhisa Taguchi

STUDIES ON HEAVY METALS POLLUTION OF PINE NEEDLES BY DUSTS. *(Kashima chiku ni okeru funjin no jumoku e no eikyo ni tsuite-- matsuba no jukinzoku ganyuryo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):313, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 61.)*

The heavy metal content in black pine needles were measured to see the effect of air pollution in the Kashima area. The samplings of needles were collected at nine locations including two control areas between Sept. and Dec. 1972; they were washed, and the cleansing water and needles were dissolved by nitric and perchloric acid and analyzed by atomic absorption spectrophotometry. The soil specimens were dissolved by aqua regia-perchloric acid. The average content of iron in pine needles was 608 ppm, manganese, 299 ppm, zinc, 29 ppm, lead, 3.8 ppm, copper, 2.7 ppm, nickel, 1.4 ppm, chromium, 1.4 ppm, and cadmium, 0.26 ppm. The amount of Fe near an iron factory was particularly high and was 10 times over the Fe content in the needles in the control area; the amount of Mn was 1.5 times over, Zn, 3 times, and Pb, 2.5 times. There was a significant correlation between the amount of settling particles on the needles and the content in the needles. The amount absorbed from the dissolved settling dusts into pine needles seemed greater than the amount absorbed from the soil.

36376 **APTIC NO. 58588**

Yabuki, Kazutoshi and Masatoshi Aoki

ON THE ECOLOGICAL SURVEY OF PLANT ACTIVITY BY INFRA-RED COLOUR AERIAL PHOTOGRAPH. *(Sekigai kara koku shashin ni yoru shokubutsu kassei no* *seitai chosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):596, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 596.)*

Infrared color aerial photography was used to investigate the conditions of vegetation in Osaka prefecture. The areas surveyed were Sakai and Tanagawa and the trees surveyed were black pine and oak. A photo-pattern analyzer was used and the conditions of trees were expressed by the ratio of red and blue photo permeation volumes. In the Tanagawa area, there was a clear difference in the condition of black pines in polluted and non polluted areas. The photosynthetic capability distribution of coral trees in Sakai, and the activity distribution of black pines in the Tanagawa area, and the activity distribution of oak in the Sakai area are presented by maps.

36377 **APTIC NO. 58798**

Yoshida, Fukuko and Hajime Mori

AIR POLLUTION AND DAMAGES TO TREES PLANTED ALONG ROUTE FOUR IN FUKUSHIMA CITY. *(Fukushima shinai 4-go kokudo no kuki osen to gairoju no higai). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):597, Oct. 1973 (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 318.)*

The effects of automotive exhausts gases on trees were observed along Highway No. 4 in Fukushima. The observed trees were 319 Sophora japonica (dog pagoda trees) planted on both sides of the highway covering about 4.5 km. The period of observation was between April 1973 through the end of this fall. The young leaves began to bud about April 10, opened about April 17th, and damage began to appear from about May 10; by July and August, damages such as discoloration, shrinking, tearing, and drying up progressed considerably. Some leaves were covered by dusts as much as 10 wt% of the total weight of the leaves. The trees in the control areas in the suburbs showed almost no damage, except for some slight chlorosis. The chlorophyl measurements increased up to early July and decreased thereafter in the polluted area; the measurements were much higher in the control areas.

1972

36378 **APTIC NO. 58719**

Dean, C. E. and D. R. Davis

OZONE AIR POLLUTION AND WEATHER FLECK OF TOBACCO. *Florida Univ., Gainesville, Agricultural Experiment Station and Florida Univ., Gainesville, Dept. of Agronomy, Circ. S-218, 10p., May 1972.*

Air pollution in the form of ozone can cause serious economic loss to tobacco in Florida. Ozone-induced weather fleck is characterized by small grayish-brown spots on the leaves, most prominent on the upper surface. Only mature leaves are usually affected. The normal ozone concentration in the lower levels of the atmosphere is 3 pphm or less, far less than the maximum allowable concentration of 10 pphm for 8 hr or longer. Ozone concentrations generally drop during the night, reaching their lowest levels just before sunrise. After sunrise, concentrations rise sharply, reaching a maximum near or shortly after mid-day. Daily concentrations generally reach highest levels in the late winter, spring, and early summer, which spans the tobacco production season in Florida and neighboring states. Usual concentrations of 1-3 pphm do not affect tobacco. Concentrations of 4 pphm or more may be associated with various weather systems which may adversely affect tobacco. High ozone concentrations in association with ozone-rich air masses and with air pollution are the ones that pose the greatest threats to tobacco. Tolerance or resistence in tobacco varieties can reduce the risk of weather fleck injury; however, when ozone concentrations become high enough, almost any variety can be damaged if soil moisture is excessively high. Advisories on future ozone levels are released daily by the National Weather Service during the tobacco production season, so that growers can take steps to minimize losses from weather fleck. Courses of action are rapid removal of all marketable leaves at a susceptible maturity level and/or withholding irrigation so that the plants will not be predisposed to fleck injury. (Author summary modified)

36379 **APTIC NO. 59028**

Dochinger, Leon S.

IMPACT OF AIR POLLUTION ON FOREST TREE PLANTINGS. *Soil Conservation Society of America, Earth Around Us, Proc. Soil Conserv. Soc. Am., Annu. Meet., 27th, Portland, Oreg., 1972, p. 134-138. 9 refs. (Aug. 6-9.)*

Phytotoxicants include ozone, nitrogen oxides, sulfur dioxide, fluorides, chlorine, hydrogen chloride, ammonia, and particulate matter. The sources and symptoms of these pollutants are reviewed. The effects of these pollutants on both broad-leaved and coniferous trees, on forest tree plantings, and on Christmas tree farms are mentioned. Acute and chronic effects are discussed.

36380 **APTIC NO. 58826**

Materna, Jan

EFFECT OF LOW SULPHUR DIOXIDE CONCENTRATIONS ON SPRUCE. *(Einfluss niedriger Schwefeldioxydkonzentrationen auf die Fichte). Text in German. Mitt. Forst. Bundesvers., vol. 97:219-232, 1972. 7 refs. (Presented at the International Symposium of Forest Fume Damage Experts, 7th, Essen, West Germany, Sept. 7-11, 1970.)*

The long-term effects of low sulfur dioxide concentrations on the growth and health of Norway spruce trees were studied. Four-year-old trees were exposed to SO2 during the growing seasons of six successive years, the gas concentrations being between 0.24 and 0.40 mg/cu m of air; in no case did the concentration exceed 1 mg, even for a short time. Samples were taken each year for needle analysis. Only once during the experimental period could external damage be observed on some of the plants, although tree growth was slightly reduced. The following changes in the chemical composition of the needles were observed: a rise in the amino acid content; a decrease in the starch and vitamin C content; a slight decrease in glucose and fructose, with a significant decrease in sucrose; and an increase in the potassium, calcium, magnesium, and sulfur concentrations.

36381 **APTIC NO. 58941**

Matsuoka, Yoshihiro, Tsuyoshi Takasaki, and Osamu Udagawa

FLUORINE ACCUMULATION IN RICE PLANT LEAVES WITH AIR-BORNE FLUORIDE. *(Fussokei taiki osen ni yoru suitoyochu no fusso shuseki ni tsuite). Text in Japanese. Chiba-ken Nogyo Shikenjo Kenkyu Hokoku (Bull. Chiba-Ken Agr. Exp. Sta.), no. 12:57-62, March 1972. 21 refs.*

Injury of rice plants due to fluorine emitted by aluminum refining and phosphate fertilizer plants in the Keiyo heavy industrial district of Chiba Prefecture in July 1969 and July 1970 was studied. The fluorine determination by AOAC procedure was unsuitable for siliceous vegetation such as rice because of the large amount of silica contained. An improved procedure of fusing calcination with sodium carbonate was more accurate. The new procedure was used to determine F in this investigation. Fluorine caused leaf blade necrosis, but scarcely damaged the leaf sheath before the heading stage. Remarkable injury appeared on the tip of the leaf blade, but was slight on the lower portion of the leaf. The leaf also changed color. Irregularly shaped chlorotic spots appeared in the healthy tissues of severely injured leaves. A large amount of fluorine was contained in the rice leaf, but only a little was found in the stem, leaf sheath, and ear. Concentrations of F in the leaf differs according to the leaf position on the stem. The highest concentration of F was contained in the most severely damaged leaves. Fluorine was scarcely translocated to stem or ear from the leaf. Seven hundred ppm of F on a dry weight basis was contained in the tip of the leaf blade, and 80 ppm F in the base of the leaf. Fifty-six percent of the total F was accumulated in the tip of the leaf. Almost all of the F was accumulated in necrotic tissue of the injured leaf. The remarkable rice injury occurred 1-2 km downwind from the major source of F, and slight injury occurred within 3 to 4 km. From the leaf analysis, F was confirmed to be absorbed in leaves within 4-5 km where visible injury was not recognized.

36382 **APTIC NO. 58668**

Thomson, William W. and Elizabeth S. Swanson

SOME EFFECTS OF OXIDANT AIR POLLUTANTS (OZONE AND PEROXYACETYL NITRATE) ON THE ULTRASTRUCTURE OF LEAF TISSUES. *Electron Microscopy Society of America, Ithaca, N. Y., Proc. Electron Microsc. Soc. Am., Annu. Meet., 30th, Los Angeles, Calif., 1972, 2p. 5 refs.*

Electron microscopic examination of leaves from bean, tobacco, and cotton plants fumigated for 0.5 to 2 hr with 0.3 to 1 ppm of the individual oxidants revealed that changes in the ultrastructure of the cells occurred in a sequential fashion with time following the fumigation period. Although occasional cells showed severe damage immediately after fumigation, the most obvious change was an enhanced clarity of the cell membranes. Subsequently, and often prior to the appearance of any visual symptoms of damage, changes in the chloroplasts and mitochondria are observed. In bean and cotton leaves the chloroplast stroma becomes denser and ordered arrays of granules and fibrils develop. In tobacco the ordered arrays of granules did not occur but the stroma increased in density and grana frequently had a curvilinear appearance. However, determination of chloroplast axial ratios indicated a general decrease in volume of the tobacco chloroplasts in the fumigated plants as compared to control plants. The increased density of the stroma, formation of fibrils, and general decrease in volume is probably the result of an increased dehydration of the chloroplasts brought on by permeability changes induced by the pollutants.

36383 **APTIC NO. 59259**

Vanin, A. F., A. A. Mutuskin, K. V. Pshenova, E. N. Frolov, D. Sh. Burbaev, and I. L. Lisovskaya

REACTION OF PLANT FERREDOXIN WITH NITRIC OXIDE. *Mol. Biol. (English translation from Russian of: Molekulyarnaya Biologiya), 6(1): 21-25, 1972.*

The reaction of nitric oxide with pea leaf ferrodoxin was investigated. The absorption spectrum of oxidized ferredoxin did not change upon contact of the ferredoxin with NO. Absorption bands characteristic of oxidized ferredoxin in contact with NO and subjected to the effect of weak acid or dithionite. This band is probably due to a complex of NO with cysteine residues. An EPR signal of a nitrosyl complex of iron with cysteine was not found. The data obtained are examined on the basis of a persulfide model of the structure of nonheme iron complexes in ferredoxin. (Author abstract)

1970

36384 **APTIC NO. 59182**

Brennan, Eileen and Philip M. Halisky

RESPONSE OF TURFGRASS CULTIVARS TO OZONE AND SULFUR DIOXIDE IN THE ATMOSPHERE. *Phytopathology, vol. 60:1544-1546, Nov. 1970. 12 refs.*

Turfgrasses representing several genera and species were exposed for 6 hr to an atmosphere containing ozone (0.23-0.30 ppm) or sulfur dioxide (0.75-1.80 ppm). Response to either pollutant varied with the grass fumigated. Generally, bent grass and annual bluegrass were most sensitive to O3; Bermuda grass and zoysia were most resistant; and perennial ryegrass, Kentucky bluegrass, and red fescue were intermediate in their response. Symptoms of O3 toxicity were, typically, bleaching and necrosis of the leaf blade, except for pigmented stipples in red fescue. Red fescue and bent grass were most sensitive to SO2; bluegrass and ryegrass were intermediate; and Bermuda grass and zoysia were resistant. Sulfur dioxide toxicity consistently resulted in necrosis of the terminal portion of the leaf blade. (Author abstract)

36385 **APTIC NO. 59184**

Gilbert, Oliver L.

NEW TASKS FOR LOWLY PLANTS. *New Scientist, vol. 46:288-289, May 1970. 1 ref.*

The occurrence and behavior of easily identified lichens and bryophytes can be used as an index of sulfur dioxide pollution, since SO2 kills them. As these lower plants range from very sensitive to highly resistant, they can be arranged to form a scale from which levels of SO2 can be estimated. Also, by mapping the distribution of selected species, the size and shape of an area affected by pollution can be determined. Ideally, these indicator species should be widespread, easy to recognize, and among them show a wide range of sensitivity so that the rate of fall off of pollution can be assessed. A table of SO2 estimates correlated to plant incidence is given, along with some examples of application of the principle. Pollutants other than SO2 have only barely detectable effects on lower plants, however, observations around aluminum smelters suggest that lichens are also useful indicators of fluorine pollution.

1969

36386 **APTIC NO. 59198**

Preuss, Peter W. and Leonard H. Weinstein

STUDIES ON FLUORO-ORGANIC COMPOUNDS IN PLANTS. II. DEFLUORINATION OF FLUOROACETATE. *Contrib. Boyce Thompson Inst., 24(7):151-156, April-June, 1969. 13 refs.*

Experiments were conducted to confirm that germinating peanut seeds contain enzymes which split the carbon-fluorine bond of fluoracetic acid, an extremely toxic compound to animals, and to determine if fluoracetic acid can be metabolized to fluorofatty acids in Acacia georginae. About 15% of the fluorine supplied to germinating peanut seeds as sodium fluoroacetate was found in the inorganic form in the seedlings or in the incubation medium after 48 hr, indicating that defluorination is an important part of the metabolism of fluoroacetate by higher plants. Only 2-5% was detected after incubation of boiled seeds. The gas chromatographic pattern of fatty acids of control and fluoroacetate-treated Acacia seeds was the same; and analysis of each peak by mass spectrometry provided no evidence for the presence of a fluorine atom attached to the fatty acids, indicating defluorination is an early step in the metabolism of fluoroacetate in this species. (Author abstract modified)

36387 **APTIC NO. 58607**

Thomson, W. W., W. L. Berry, and L. L. Liu

LOCALIZATION AND SECRETION OF SALT BY THE SALT GLANDS OF TAMARIX APHYLLA. *Proc. Nat. Acad. Sci., 63(2):310-317, June 1969. 17 refs.*

Salt secreted by the salt glands of Tamarix aphylla was analyzed. Its composition is dependent on the salt composition of the root environment. Rubidium ion, if added to culture solutions in which the plants are growing, is also taken up by the plants and subsequently secreted by the glands. Electron micrographs of glands from the rubidium secreting plants show accumulations of electron dense material in the microvacuoles of the secretory cells. The rubidium is accumulated in the microvacuoles and subsequently secreted by their fusion with the plasmalemma. (Author abstract modified)

EFFECTS-MATERIALS

1974

36388 **APTIC NO. 58901**

Mohler, J. B.

THE CORROSIVITY OF THE ATMOSPHERE. *Plating, 1(1):62-65, Jan. 1974. 8 refs.*

Data for exposures at 45 sites are presented for 10 by 15 cm steel and zinc panels exposed for two years, and results are given for several environments calibrated with zinc and cadmium plated steel panels. Zinc-steel data, though useful for estimating the life of zinc-coated steel in various environments, are of limited use in terms of site calibration because the steel does not corrode linearly on an annual basis. Calibrations are more meaningful when two metals respond linearly on an annual basis at different rates. Zinc and cadmium show promise in filling this need, and charts showing the relationship between zinc and cadmium expressed as mils per year of corrosion can be valuable when making first estimates of corrosivity. The sites included urban, marine, industrial, and rural sites.

1973

36389 **APTIC NO. 58800**

Ebara, Ryuichiro, Takafumi Shibata, and Isao Masumoto

EFFECT OF ENVIRONMENTS ON FATIGUE STRENGTH OF STEELS. *(Kozai no tsukare tsuyosa ni oyobosu aryusan gasu funiki no eikyo). Text in Japanese. Tetsu to Ko (Iron Steel), 54(14):128-134, Dec. 1973. 17 refs.*

Fatigue strength of steels is decreased by oxygen, humidity, and some impurities. The effect of sulfur dioxide on fatigue strengths was studied by rotating bending fatigue tests of a mild steel, 60 kg/sq mm and 80 kg/sq mm high strength steels, and an 18-8 stainless steel. The atmospheres studied were air, humidified air, dry SO2 gas, mixed gas of dry SO2 and humidified air, mixed gas of dry hydrogen sulfide and humidified air, water, and sulfuric acid. The fatigue strength of the mild steel and the influence of dry SO2 was not recognized, but the influence of mixed dry SO2 and humidified air was determined. The degree of that influence, however, was almost the same as that for humidified air alone. Therefore the influence of SO2 on the fatigue strength of the mild steel seems to be little, but some influences of SO2 gas can be surmised from the characteristic aspect of fractured surfaces On the 60 kg/sq mm and 80 kg/sq mm high strength steels and the 18-8 stainless steel the influence of SO2 gas was not observed. Sulfuric acid had a very conspicuous influence on all steels.

36390 **APTIC NO. 58938**

Fukushima, Minoru

AIR POLLUTION AND METAL CORROSION. (5) STUDIES OF CORROSION PREVENTION COATINGS FOR OUTDOOR STEEL MADE STRUCTURES. *(Taiki osen to kinzoku fushoku shirizu. (4) Okugai tetsu kozobutsu ni kitai sareru boshoku toso ni tsuite). Text in Japanese. Bosei Kanri (Rust Prev. Contr.), 17(6):17-22, June 1973. 7 refs.*

The relationship between air pollution and deterioration of the surface coating on a bridge was studied at eight different points. Pollutants were washed off with 200 cc of deionized water and the concentrations of chlorides, sulfur dioxide, and nitrogen trioxide, pH, and percentages of soluble and insoluble substances were determined. The pH ranged from 4.5 to 6.8 with no relation to amounts of Cl, SO2, and NO3. Amounts of NO3, Cl, and SO2 increased in this order. The inner side of the bridge was more degraded than either the outer or lower side. Soiling, discoloration, rusting, and the peeling away of surface coatings were observed. Soiling occurred mostly at points of heavy traffic. Coatings containing a leaded pigment were blackened by SO2 gas from the polluted river. Separation of the coating layers appeared mainly at points where an original coating was allowed to remain in the atmosphere for a considerable length of time before subsequent coatings were applied. Phthalic acid resin coatings were particularly susceptible to peeling in industrial areas. Rusting was caused by water, SO2, and salt. Control methods for surface coating deterioration include the use of phenolic, epoxy, urethane resin, chlorinated rubber, or lead-containing paints and rinsing the original surface coating before subsequent applications.

36391 **APTIC NO. 58354**

Goto, Takao

MEASUREMENT OF DECAY OF AG-FOIL. *(Ginpen nado henshoku ni yoru taiki osen no kani sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):410, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 146.)*

Instead of the cumulative measurement of sulfur dioxide by lead dioxide candle, silver plate corrosion was used. Silver plates were hung for a month in a well-ventilated place protected from the rain and direct sun, and the surface changes were examined. The reflection rate was measured by a He-Ne laser beam and the adsorption of sulfur x-ray Kalpha was measured by RI fluorescent x-ray analyzer. The appearance of the reacting chemicals: hydrogen disulfide, SO2, sulfur trioxide, carbon monoxide, carbon dioxide, nitric oxide, nitrogen dioxide, oxygen, and ozone, and the degree of decomposition are given in a table.

36392 **APTIC NO. 58856**

Kaiho, Yuichi

THE EFFECTS OF AIR POLLUTION ON STRUCTURES--RAILROAD INSTALLATION MATERIALS. *(Okugai kozobutsu no taiki osen ni yoru eikyo--tetsudo shisetsu zairyo no baai). Text in Japanese. Bosei Kanri (Rust Prev. Contr.), 17(12):11-15, Dec. 1973. 7 refs.*

Various metal corrosion of outdoor structures by air pollution, especially concerning railroad installations, are discussed. The types and cases of damages on signal facilities, railing, and Y-line fixtures are discussed. Exposure tests were given to nine locations on various railroad lines. Five were located in industrial areas, one in an urban environment, two in agricultural areas, and one on the seashore. Sulfur oxides, nitrogen oxides and chlorides in the atmosphere were measured by filter papers treated in potassium carbonate. Sulfides were measured by filter papers soaked in zinc acetate and dried. The lead dioxide method was also used. Dusts and particulates were measured by deposit gauge, and gauge exposure in a screen box was used for sea salt particles. Materials examined were steel, zinc, aluminum, and copper. The air quality measurements were generally as expected, with high pollutant concentrations in industrial areas. But in areas with high sulfide concentrations, corrosion of copper was extraordinarily high. Corrosion of carbon steel after one year of exposure in industrial areas ranged from 5.1-88.3 mg/d sq m/day; at the shore 3.3-70.0 mg/d sq m/day; in urban areas; 5.6-12.7 mg; and in agricultural areas, 1.4-8.9 mg/d sq m/day. Zinc corrosion ranged 0.16-1.66 in industrial areas; 0.23-2.62 at the shore; 0.28-1.06 in the city; and 0.05-0.51 in agricultural areas.

36393 APTIC NO. 58332

Komeiji, Tetsuto, Tadashi Sawada, Toshio Odaira, Yoichi Yamamoto, and Morio Kadoi

METAL CORROSION IN THE POLLUTED ATMOSPHERE. *(Taiki osen ni yoru kinzoku fushoku no kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):409, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 145.)*

To examine the relationship between air pollution and metal material damages in Tokyo, carbon steel pieces were exposed to the atmosphere between Sept. 1970 and Feb. 1972, and the results were studied. The test pieces were stabilized at an inclination of 45 deg facing south, at seven locations of various degrees of air pollution. Before installing the pieces, they were cleaned by acetone and weighed; after the exposure test, rusts were eliminated by a knife, and the pieces were washed in 10% solution of ammonium citrate and weighed. The rusts were analyzed. Sulfur oxides, chlorine compounds, nitrogen oxides, and setting particles in the air were measured. The degree of corrosion was greater in the summer (0.013-0.028 mm/mo) than winter (0.0008-0.003 mm/mo). The degree of corrosion in a highly polluted area was about 1.4-3.1 times over that of the lightly polluted area. Over 9 months, corrosion in the highly polluted area advanced 1.7 times over that of lightly polluted area; in 18 months, corrosion progressed 1.5 times over that of medium polluted area. Rust compositions showed no geographical differences. Corrosion and meteorological factors showed strong correlations, and corrosion and settling particle electroconductivity showed a correlation.

36394 APTIC NO. 58585

Nakayama, Masamichi

THE EFFECTS OF AIR POLLUTION ON COATING FILMS. *(Taiki osen ni yoru tomaku e no eikyo). Text in Japanese. Kinzoku Hyomen Gijutsu (J. Metal. Finish.), no. 11:29-36, 1973. 11 refs.*

The anti-corrosive surface coatings of oil, phthalic acid resin, vinyl, rubber chloride, or epoxyl have been corroded or damaged by various air pollutants. The pollutants causing such damages as discoloring, blistering, peeling, rusting, swelling, and rotting are gaseous pollutants such as sulfur dioxide, sulfur trioxide, hydrogen sulfide, mercaptans, nitric oxide, nitrogen dioxide, nitric anhydride, nitric acid, ammonia, ozone, peroxides, fluoride, chlorine, hydrogen fluoride, hydrogen chloride, acid mists, settling particles, suspended particulates, metal oxide particles, corrosive salts, and marine salts. The degree of damage by these pollutants is heavily affected by their combinations, concentrations, wind direction and velocity, rain quantity, temperature and humidity. The degree of swelling, rusting, and other types of corrosion are much greater in chemical industrial areas with heavy SO2 concentrations, and in humid areas.

36395 APTIC NO. 58813

Nishida, Kozo

AIR POLLUTION AND METAL CORROSION. (4). IMPORTANCE AND PRESENT ACTIVITY FOR WEATHERING TEST IN VARIOUS COUNTRIES. *(Taiki osen to kinzoku fushoku shirizu. (4). Taiki bakuro shiken no juyosei to kakukoku no genjo). Text in Japanese. Bosei Kanri(Rust Prev. Contr.), 17(4):11-16, April 1973. 4 refs.*

Weathering tests are discussed as a means of measuring materials deterioration. Materials damage is caused by chemical reactions between the material itself and influences of air pollution, meteorology, or a combination of the two. The first commercial weathering test was done in Florida in 1973. Japan has studied the weather resistance of plastics since 1963. Great Britain, Germany, France, and Russia are also studying weathering.

36396 APTIC NO. 59096

Ragot, J. P.

POLLUTION BY SULFUR AND ITS COMPOUNDS, AND THE DECAY OF MATERIALS. CONTRIBUTION OF PETROLOGY TO THE STUDY OF THESE PHENOMENA. *(Pollution par le soufre et par ses derives et degradation des materiaux. Contribution de la petrologie a l etude de ces phenomenes). Text in French. Ann. Mines (Paris), 1973:33-38, Nov.-Dec. 1973. 26 refs.*

The effects of sulfur compounds on building stones are reviewed. The decay of building stones is mainly due to the increased atmospheric sulfur dioxide content, and more specifically to the increased sulfate ion concentration in precipitation. Sulfates present in the soil are reduced to hydrogen sulfide under anaerobic conditions, and organosulfur compounds attacked by microorganisms also form H2S. Microorganisms oxidize H2S, polythionates, and metalloid sulfur to sulfuric acid. Sulfate ions present in an aqueous medium may attack carbonates directly or indirectly by concentrating hydrated calcium sulfate whose force of crystallization is high enough to separate the constituents of the building materials, which as a result become friable and porous. Hydrophobization, and bactericides are suitable for the prevention of stone decay.

36397 APTIC NO. 58793

Sakae, Yukio and Kichiro Onimura

CORROSION AND ITS PREVENTION OF DISTRICT COOLING AND HEATING PLANT. *(Chiiki reidanbo setsubi no boshoku mondai). Text in Japanese. Zairyo (J. Soc. Material Sci., Japan), 22(242): 981-989, Nov. 1973. 15 refs.*

The corrosion of materials occurring in the area of cooling and heating plants is the subject of this study, and corrosion caused by air pollution is briefly touched upon. Corrosion of pipes and conductor materials can occur by oxygen, sulfur oxides, nitrogen oxides, and other pollutants dissolving in the water. The corrosion can be complex when the pollutants of various kinds such as SO2, NOx, and ammonia are mixed; therefore the selection of material for piping, conductor, and condenser should take the environment into consideration. Cases of condenser impingement attack or condenser rupture occur by pH drop in the cooling water caused by air pollution. The use of inhibitors can prevent the corrosion to some extent.

36398 APTIC NO. 58916

Singhania, G. K. and B. Sanyal

BEHAVIOUR OF RUST AND RUSTED STEEL SURFACES. *Brit. Corros. J., 8(5):224-229, Sept. 1973. 21 refs. (Presented at the International Congress on Metallic Corrosion, 5th, Tokyo, Japan, May 1972.)*

Experiments were performed to assess the effect of the presence of rust on steel on its further corrosion during outdoor and laboratory exposure to sulfur dioxide. Pre-rusted specimens which were first exposed to SO2 and then to humid SO2-free air showed iron sulfate formation in the moist, SO-2 free air at conditions insufficient for the formation of the reaction product on clean metal. The amount of corrosion was not dependent on the amount of SO2 adsorbed by the rust, and the duration of the pre-rusting period determined the subsequent rate of rusting. The age of the rust, rather than its thickness, determined its protective effect. (Author abstract modified)

36399 APTIC NO. 58541

Sotokawa, Yasuto

CORROSION OF ELECTROPLATED METALS BY ENVIRONMENTAL POLLUTION. *(Kogai osen to mekki seihin no fushoku). Text in Japanese. Kinzoku Hyomen Gijutsu (J. Metal Finish.), no. 11:21-28, 1973.*

The types of electroplating for metals and the degree of corrosion by air pollutants are discussed. The copper-nickel-chromium plating begins to corrode from faulty parts, the copper plating next to the base begins to dissolve, and sulfur dioxide and sea salt particles in the air enlarge the corrosion. When the base material is iron, the corrosion is accelerated by the presence of Cu. The Ni-Cr plating causes corrosion of the base metal if pinholes and cracks exist on the coating. Plating with a 10-micron thickness does not protect the metal from corrosion. The Ni-Ni- Cr plating protects the base metal because the first corrosion begins with the first layer of Ni next to the metal, but the Ni-Ni-Ni-Cr plating is even better. In relatively heavy SO2 pollution, a plating of 20 micron has 10-12 months anti- corrosiveness. But the same type of plating with a 10-micron thickness does not protect metal. In exposure tests, 10-micron plating of this type corroded a test piece quicker than any other type. Zinc plating corrodes at the rate of 0.003-0.005 mm/year at the seashore, and 0.005-0.01 mm/year in industrial areas. Zinc electroplating treated by chromic acid with a thickness of 17-21 micron could not prevent rust in three years in heavily polluted areas, but at the shore and inland, prevented rust for five years. The factors affecting corrosion are the atmospheric temperature, humidity, rain quantity, SO2, and marine salt particles. Pollutants leading to corrosion are: SO2, settling particles, hydrogen sulfide, ammonia, and mercaptans.

36400 **APTIC NO. 58355**

Suzuki, Masao, Motoharu Nakanishi, and Sadao Omichi

EFFECTS OF AIR POLLUTION ON METAL PLATE. *(Kinzokurui ni oyobosu taiki osen no eikyo; kiki bunsekiho ni yoru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):438, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 172.)*

Four kinds of metal plates were exposed to the temperature at two locations in Ichihara, and the degrees of corrosion were examined by x-ray refraction and weight changes. The metals used were iron, copper, zinc, and aluminum, and the test plates were exposed inside and outside of screen boxes for 3, 6, and 12 months each. All metals showed approximately straight linear weight changes. Copper and Al had greater corrosion rates in the screen box, and Zn showed a great weight decrease outside the box and an increase inside the box. The x-ray refraction of corroded Cu, quantitative changes of rusts, and metal weight changes are presented in graphs.

36401 **APTIC NO. 58586**

Terai, Shiro and Zenichi Tabe

CORROSION OF ALUMINUM BY ENVIRONMENTAL POLLUTION. *(Kogai osen to aruminiumu no fushoku). Text in Japanese. Kinzoku Hyomen Gijutsu (J. Metal Finish.), no. 11:37-42, 1973. 14 refs.*

Air pollution changes the composition of water in the air and causes corrosion of aluminum. Ordinarily, water in the air is within the range of pH 5.5 and 7, because of carbon monoxide. But the pH in industrial areas is often much lower due to sulfur dioxide. The surface coating of aluminum is alumina and its hydrates, and the solubility of the coating changes by pH. In the lower pH, aluminum deteriorates drastically. The direct effects of SO2 on aluminum are not as damaging as they are on steel, iron, and copper. Heavy corrosion has been noted on tunnels and railroad station roofs, but this is galvanic corrosion caused by metal and carbon particles in combination with SO2; the damage is especially heavy on a high-power alloy with copper. Nitrogen oxides are believed not to affect aluminum. In industrial areas, corrosion of aluminum alloys are much greater than in non-industrial areas, but it is not necessarily by SO2 alone. The combination of SO2 with iron, carbon, and dust particles contribute much to the damage. The amount of corrosion of various aluminum alloys after 10 years of exposure at various locations were measured and reported in a table. In various areas, when aluminum was plated by zinc iron, the entire 1 mm was completely corroded, especially in the shore areas.

1972

36402 **APTIC NO. 59196**

Villeto, John, Jr. and Howard L. Ohman

PARTICULATE MATTER CONSIDERATIONS IN THE DESIGN OF V/STOL AIRCRAFT. (REPORT NO. 2 OF STUDIES OF THE ARMY AVIATION V/STOL ENVIRONMENT). *Army Engineer Topographic Labs., Fort Belvoir, Va., Earth Sciences Div., Special Rept. ETL-SR-72-2, 40p., Aug. 1972. 12 refs.*

NTIS, DDC: AD 749463

Considerations concerning damage caused by airborne particulate matter to V/STOL aircraft are presented. Topics covered include: major factors affecting particle erosiveness, chemical corrosion by airborne particles; mechanical and other miscellaneous problems caused by airborne particles; major detrimental airborne soil particles and their geographic distribution; factors influencing soil particles becoming airborne; airborne particle cconcentrations under various field conditions; measured airborne particle sizes and concentrations near a hovering helicopter; and computed velocities and maximum particle diameter sizes in the interaction plane produced by two opposing wall jets. Silica, alumina, and hematite are the three most common and troublesome airborne particles on a world wide basis; while sulfates, chlorides, and carbonates are the most common airborne salt particulate matter. Airborne oceanic and soil salts when combined with moisture promote chemical corrosion.

EFFECTS-ECONOMIC

1974

36403 **APTIC NO. 58903**

Seizler, David R. and William D. Watson, Jr.

HOT VERSUS ENLARGED ELECTROSTATIC PRECIPITATION OF FLY ASH: A COST-EFFECTIVENESS STUDY. *J. Air Pollution Control Assoc., 24(2):115-121, Feb. 1974. 25 refs.*

A cost-effectiveness analysis of the problem of designing hot versus enlarged precipitators for the collection of low sulfur fly ash from coal-fired electric power plants was performed. The analysis used data on 37 full scale electrostatic precipitator systems to determine an empirical Deutsch-type efficiency equation, and precipitator installation costs were estimated by minimizing precipitator accounting costs subject to the empirically derived efficiency equation. Cost comparisons used a range of cost parameters designed to cover widely varying plant and locational circumstances. Comparison of hot versus enlarged precipitators indicated that for almost all American low sulfur strippable coals, an enlarged precipitator would be likely to be less costly. An enlarged precipitator would be likely to be less costly even for coal whose sulfur content was reduced through washing, since economically efficient washing would probably reduce both the sulfur and the ash contents of the coal. (Author abstract modified)

36404 **APTIC NO. 59345**

Uhlig, Christoph Andreas

AIR POLLUTION, AIR CONSERVATION AND INTERNATIONAL ECONOMIC RELATIONS. *Experientia Suppl., no. 20:95-106, 1974. 6 refs.*

The connection between air pollution and international economic relations is examined, and a very simplified economic model is developed to show that internationally differing stringency of measures for air conservation can induce various international economic flows which may have undesired ecological results. National measures against air-polluting production processes may influence not only the international flow of products and capital but may also induce the transfer of polluting industries to countries with less stringent measures. The environmental problem cannot be dealt with on the basis that stringent air conservation measures are unnecessary in low-populated or economically less-developed countries since economic movements may set in to such an extent that great efforts would be required to remove the results of pollution from such countries. A more integrated approach is required which considers the interrelationships in complex ecological systems, the adjustments in dynamic economies, and the concrete socio-economic situations.

1973

36405 **APTIC NO. 59245**

Easton, J. C. and H. M. McFarlane

ECONOMICS OF PULP AND PAPER POLLUTION ABATEMENT. *European Liaison Committee for Cellulose and Paper, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 701-737, 747-748. 40 refs. (May 7-11.)*

The costs of air pollution abatement in the pulp and paper industry is discussed in a report on the economics of environmental pollution control. The analysis is limited to airborne particulate matter and odorous gases from a large bleached kraft pulp mill. The capital costs are estimated at $1,235,000 and include provisions for a 99.5% efficiency electrostatic precipitator, scrubbers, a multistack dust collector, a recovery boiler, a black liquor solids concentrator, and equipment for the combustion of gases and the treatment of condensate. The annual operating cost is estimated at $66,000 or $0.96/ton. These costs apply to the construction of a new mill. In the case of an existing mill, the cost for air pollution abatement could be considerably higher. The estimated cost of air pollution abatement in the sulfite industry would be lower than in the sulfate industry and figures at about $0.30/ton.

36406 **APTIC NO. 58489**

Giuliani, G.

COST ESTIMATE OF THE DESULFURIZATION OF PETROLEUM RESIDUES. *(Valutazione del costo della desolforazione di un residuo petrolifero. Text in Italian. Riv. Combust., 27(8):406-410, Aug. 1973. 10 refs.*

A comparison is given of the direct and indirect hydrogen desulfurization of petroleum residues as a function of the desulfurization efficiency. Regarding the overall operating costs, direct desulfurization is less expensive than the indirect desulfurization (2.72 L/kg of residue treated against 1.42 L/kg). However, the degree of desulfurization is higher for direct desulfurization, permitting an average residual sulfur content of 1% and a minimum of 0.3% to be obtained. The specific cost of desulfurization per % of sulfur removed is slightly higher for the direct process than that for the indirect method (0.9 L/kg against 0.81 L/kg).

36407 **APTIC NO. 58709**

Hirst, Eric

ENERGY REQUIREMENTS FOR ENVIRONMENTAL QUALITY. *In: Electrical Energy and Its Environmental Impact. Progress Report -- June 30, 1973. Oak Ridge National Lab., National Science Foundation Interagency Agreement AEC 40-237-70, NSF AG 398, p. 3-9, July 1973. 4 refs.*

NTIS: ORNL-NSF-EP-55

The effect of the implementation of environemtnal protection plans on national energy use is discussed. Urban passenger traffic (including mass transit, automobile emission standards, and automobile fuel consumption) waste water treatment, solid waste management, air pollution abatement, and waste heat dissipation are examined. The energy required to operate 90% efficient particulate and 70% efficient sulfur removal systems at power plants, furnaces, cement plants, incinerators, and fossil fuel cleaning facilities is estimated at 840 trillion Btu. The energy to operate wet cooling towers at electric power plants is estimated at 160 trillion Btu. The total energy use for hypothetical 1970 environmental quality measures equals 2465 trillion Btu (3.66% of the total U. S. energy budget), which is offset by a savings of 2150 trillion Btu (-3.19% of the energy budget). The energy required to construct environmental protection systems was not considered; only operating energy costs were included. In spite of this and other limitations, quantitites of energy required to achieve environmental protection quality goals are relatively small. The energy needs for environmental protection can be offset through application of various conservation measures such as increased recycling, generation of electricity with solid waste, shift from autos to mass transit, and redesign of autos to improve fuel economy. The conclusions in regard to primary energy closely correspond to those for electricity.

36408 **APTIC NO. 58931**

Jones, P. M. S.

COST ANALYSIS IN THE FIELD OF AIR POLLUTION. *Atmos. Environ., 7(12):1191-1198, 1973. 5 refs.*

Difficulties involved in environmental damage cost analysis, the relevance of damage cost analysis to decision making in the research and development field, and the potential use of this type of data are considered. The fact that it is easy to postulate hypothetical effects in environmental fields and very difficult to demonstrate a zero effect, combined with the absence of adequate scientific data, make the economic appraisal of the consequences of pollution extremely difficult. Methodology is described which results in a value for the extra cost incurred in polluted areas relative to those in less polluted areas, and a linear relationship is assumed which enables one to get from the incremental damage to total damage costs on the basis of the average levels of pollution. Broad allocations are then made to different sources on the basis of their emissions and their proximity to sites where damage can be caused once the total costs have been derived. A cost pattern is presented which was arrived at as a result of this treatment and an assessment of the likely levels of emission from different sources by the year 1980, taking into account the growth of different industries, the increase in the number of vehicles, and pollution control factors.

36409 **APTIC NO. 58910**

Sinclair, Craig and Pamela Newick

RESEARCH AND DEVELOPMENT BUDGETS, POLLUTION AND HAZARDS. *Sci. Policy, 2(4):99-105, July/Aug. 1973. 27 refs.*

A survey of the research associations and the 300 largest research and development spending companies in the United Kingdom was conducted in an effort to estimate the current distribution of effort in anti-pollution or disamenity research. Expenditures for air pollution reduction appear to have increased from approximately $140,000 to $350,000 between the years 1968-1970 for research associations and from $575,000 to $850,000 for industrial research and development. Total figures for disamenity research (roughly 4.5% of the full budgets) appear to be strongly influenced by the particular spending pattern of the larger associations, and changes in these distort any overall trend; however, allowing for inflation, there does not seem to be a marked upward movement in disamenity reduction research and development budgets. This is most marked in air pollution where expenditure has more than doubled and may be an indication that while air pollution on a national basis has been largely reduced, attention is now being given on particularized levels to the removal or abatement of specific air pollution problems such as motor car exhausts and individual production methods.

1972

36410 **APTIC NO. 59058**

Organization for Economic Co-operation and Development, Paris (France), Environment Committee

PROBLEMS AND INSTRUMENTS RELATING TO THE ALLOCATION OF ENVIRONMENTAL COSTS. *Preprint, United Nations, 33p., June 1, 1972. (Presented at the United Nations Conference on the Human Environment, Stockholm, Sweden, June 1972.)*

A study on the costs of environmental control is discussed. The problem of internalizing external effects, analysis of external effects, impact of external effects, and the economic character of external effects are described. The problem of cost allocation is analyzed. The general problem is how to internalize environmental effects in economic mechanisms to ensure a rational allocation of costs. The methods to bring this about are described. Several applications of this theory are given including allocation of levying charges in France, tax abatement and air pollution control in Japan, and taxes and subsidies related to the disposal of used oils in the Federal German Republic.

36411 **APTIC NO. 59470**

Organization for Economic Cooperation and Development

ON GUIDING PRINCIPLES CONCERNING INTERNATIONAL ECONOMIC ASPECTS OF ENVIRONMENTAL POLICIES. *Preprint, Organization for Economic Cooperation and Development, Paris (France), 4p., June 6, 1972. (Presented at the Organization for Economic Cooperation and Development, 293rd Meeting, May 26, 1972.)*

Guiding principles concerning the international economic aspects of environmental policies are described as adopted by the Council of the Organization for Economic Cooperation and Development. The principles apply to the following areas: cost allocation (polluter-pays principle); environmental standards; national treatment and nondiscrimination; procedure for control; and compensation import levies and export rebates.

1971

36412 **APTIC NO. 58868**

Gilpin, Alan

ECONOMICS OF AIR POLLUTION AND CONTROL. *In: Air Pollution. St. Lucia, Australia, University of Queensland Press, 1971, Chapt. 7, p. 55-58. 2 refs.*

The economic losses attributable to air pollution are categorized. The findings of the Beaver Committee on the cost of air pollution in Britain are summarized. Estimates of the costs of air pollution in American cities are reported. A discussion of the costs of control measures includes a consideration of the situation in power stations and refineries. The case of Los Angeles is presented as an example of the high cost of control measures. A general model of cost-benefit analysis is diagrammed, showing that a sensible balance between costs and benefits is achieved when the total costs of damage and control are minimized.

STANDARDS AND CRITERIA

1974

36413 **APTIC NO. 58858**

Muskie, Edmund S.

REMARKS BY SEN. EDMUND S. MUSKIE TO AMERICAN STANDARDS INSTITUTE. *Preprint, American National Standards Inst., New York, American Society for Testing and Materials, Philadelphia, Pa., and American Society of Mechanical Engineers, New York, 6p., 1974. (Presented at the National Conference on Standards for Environmental Improvement, Washington, D. C., Feb. 20, 1974.)*

The challenges presented by the Clean Air Act of 1970 are pointed out. A preference is stated for local control of policy decisions concerning the setting and implementation of standards. It is important that the industrial and scientific communities and the public have equal roles in this regard. The combination of specific standards and deadlines will provide incentives for the development of new technology. The case of sulfur oxides removal is pointed out as an example. Improvements in automobile emission control technology, however, have not kept the pace the public has a right to expect. Improvements in alternative forms of transportation are called for. Inadequate funding of the Environmental Protection Agency is decried. Political pressure in support of protective activities is necessary.

36414 **APTIC NO. 58457**

Quarles, John

FUEL VENTING EMISSIONS STANDARD. *Federal Register, 39(28): 4884-4885, Feb. 8, 1974.*

The aircraft fuel venting emission standard is given. No fuel venting emissions may be discharged from any new or in-use gas turbine engine.

36415 **APTIC NO. 58840**

Train, Russell E.

THE NEED FOR SOUND STANDARDS FOR ENVIRONMENTAL IMPROVEMENT. *Preprint, American National Standards Inst., New York, American Society for Testing and Materials, Phila., Pa., and American Society of Mechanical Engineers, New York, 10p., 1974. (Presented at the National Conference On Standards For Environmental Improvements, Washington, D. C., Feb. 20-21, 1974.)*

The way in which the Environmental Protection Agency fashions a standard is described. Environmental standards are defined, and use of standard statistical techniques is called for. A good standard is a norm of tolerance expressed as a numerical value indicating a concentration of a pollutant for a given duration of time. To be of real use, such standards should also specify the test method to be used and should include adjustments which would bring other recognized and feasible test methods into equivalency with the specified test method. The sampling method must also be an integral part of the standard. The improvement of relations between the EPA, industry, and the public is also recommended.

1973

36416 **APTIC NO. 58899**

Fujiwara, M.

REGULATIONS AND CRITERIA FOR ATMOSPHERIC POLLUTION, WITH SPECIAL REFERENCE TO NOX AND LEAD. *(Taiki osen no kisei to kijun, tokuni NOx* *to namari ni tsuite). Text in Japanese. Kankyo Kenkyu (Environ. Studies), no. 4:45-52, Oct. 1973.*

Emission standards for sulfur dioxide, carbon monoxide, suspended particulates, nitrogen dioxide, oxidants, hydrocarbons, lead, and hydrogen fluoride are discussed. Emission standards for SO2 are 3 times as strict as those published the previous year. Automobile emissions constitute 93% of the CO, 40% of HC, and 39% of NOx total concentrations. Emission standards for 1975 cars limit CO to 2.1 g/km, HC to 0.25 g/km, and NOx to [illegible] g/km. A 5-year intermediate value for NO2 limits the daily 1-hour average concentration to 0.02 ppm for 60% of the days. Criteria for establishing standards for HC and Pb emissions are under consideration. Nitrogen oxides are regulated for boilers, furnaces in the petroleum and metallurgical industries, and sulfuric acid plants.

36417 **APTIC NO. 58696**

Hueter, F. Gordon, H. Wilfried Goerke, Necip A. Berksan, Arnoldo Liberti, and Jean Ternisien

AIR POLLUTION. AIR QUALITY CRITERIA FOR NITROGEN OXIDES. N.15. *North Atlantic Treat Organization/Committee on the Challenges of Modern Society, Expert Panel on Air Quality Criteria, 229p., June 1973. 268 refs.*

GPO

A compendium of information on the effects of nitrogen oxides in the ambient air on man and his environment has been compiled using the United States Air Quality Criteria for Nitrogen Oxides as a basic document. Topic coverage includes: properties of nitrogen oxides and physical effects on light transmission; sources and control of atmospheric nitrogen oxides; methods for measurement of nitrogen oxides; atmospheric levels of nitrogen oxides; chemical interactions of nitrogen oxides in the atmosphere; the effects of nitrogen oxides on materials and vegetation; toxicological effects of nitrogen oxides on animals and man; and an epidemiological appraisal of nitrogen oxides. An appendix is also provided for conversion tables.

36418 **APTIC NO. 59138**

Murias, Benjamin Sanchez Fernandez

BASIC CONCEPTS OF THE HYGIENIC ASPECTS OF THE REGULATION FOR AIR POLLUTION CONTROL. *(Conceptos de base para los aspectos sanitarios de la Reglamentacion de la Lucha Contra la Contaminacion de Aire). Text in Spanish. Medicamenta, 61(508):97-106, Feb. 15, 1973.*

General problems of the establishment of hygienic standards for air pollutants are discussed, and standards adopted in different countries are compared. Standards for air pollutants, to be used as guidelines for air pollution control, can be established on the basis of the available best practicable means, or on the basis of a tolerable air quality. Standards could be also established on the basis of preset quality requirements regardless of the technical and economic possibilities of meeting them. A comparison of different effect criteria used for the establishment of air quality standards for sulfur dioxide, hydrochloric acid, nitrogen oxides, and chlorine in such countries as the U.S.A., the USSR, and West Germany, shows that the considerable differences in the standards in these countries are due to such in the criteria adopted for the establishment of the standards. While U. S. standards are based on morbidity and mortality as effect criteria, USSR standards are more exacting because they consider mainly neurophysiological effects of air pollutants. Maximum allowable concentrations adopted for suspended matter, sulfur dioxide, carbon monoxide, nitrogen oxides, photochemical oxidants, hydrocarbons, and hydrochloric acid in such countries as West Germany, Czechoslovakia, Italy, Japan, the USSR, U.S.A., the Netherlands, Belgium, France, Switzerland, Sweden, and Finland are listed.

36419 **APTIC NO. 58361**

Vaughn, Dennis J. and Edward J. Stanek, II

SULFUR DIOXIDE STANDARDS: PRIMARY MORE RESTRICTIVE THAN SECONDARY? *J. Air Pollution Control Assoc., 23(12):1039-1041, Dec. 1973. 11 refs.*

The relationship between sulfur content of coals, stack heights, and maximum ground level concentrations from power plants was investigated by the state of Iowa. For the parameters used, increases in stack height above 100 ft result in minimal decreases in sulfur dioxide ground level concentrations. The use of tall stacks in meeting the National Ambient Air Quality Standards may not be the most economical method of compliance. It appears as though recommended diffusion modeling techniques, as well as a statistical analysis of empirical data, show that in almost all cases the primary SO2 NAAQS is more restrictive than the secondary standard. If primary NAAQS must be met, then a longer time allotment for meeting the secondary SO2 NAAQS is of no consequence. (Author conclusions modified)

1972

36420 **APTIC NO. 58638**

Stokinger, H. E.

TOXICITY OF AIRBORNE CHEMICALS: AIR QUALITY STANDARDS--A NATIONAL AND INTERNATIONAL VIEW. *Ann. Rev. Pharmacol., vol. 12:407-422, 1972. 22 refs.*

Official air quality standards (AQS) for industry and community in the United States are discussed and compared to those in the USSR. The basis for AQS in the USSR is unknown. They have no limits for ethylene, iron oxide, hydrocarbons, particulates or photochemical oxidants. Their standards tend to be lower than in the U. S. In the U. S. there are considerable differences between the limiting concentrations of the threshold limit values (TLV) for industrial air with the AQS for community air. Depending upon the type of air pollutant, not only is the protection of human health and well-being considered, but foliage and crop damage, soiling, visibility reduction, and corrosion may ultimately be the prime determinants of AQS. Depending upon the specific basis on which the AQS ultimately rests, differential factors between AWS and TLVs may range from one half(ozone) to one hundredth (nitrogen dioxide, sulfur dioxide, iron oxide) to one thousandth (lead) or more (hydrogen fluoride). The scientific basis for the differences in the limited concentrations of the standards for community and industrial are discussed for carbon monoxide, SO2, NO2, hydrocarbons, O3, particulates, and lead.

36421 **APTIC NO. 58720**

World Health Organization, Geneva (Switzerland), Expert Committee

AIR QUALITY CRITERIA AND GUIDES FOR URBAN AIR POLLUTANTS. *World Health Organ. Tech Rept. Ser., no. 506:1-38, 1972. 83 refs.*

The effects of various air pollutants on man, animals, and vegetation were reviewed to determine air quality criteria and guides. Pollutants studied included sulfur oxides, suspended particulates, carbon monoxide, photochemical oxidants, and nitrogen dioxide. For sulfur dioxide, excess mortality and hospital admissions are expected with 500 micrograms/cu m daily average, decline of patients with pulmonary disease is expected with 500 250 micrograms/cu m daily average, respiratory symptoms are expected with 100 micrograms/cu m annual arithmetic mean, and visibility and/or human annoyance effects are expected with 80 micrograms/cu m; for smoke these values are 500, 250, 100, and 80 micrograms/cu m, respectively. The kinetics of CO hemoglobin reactions, CO effects on the psychomotor function and on the cardiovascular system in men, and CO effects on vegetation are described. Continuous

COHb levels should be less than 4%; many smokers already have levels over 4%. The CO concentrations required to reach 4% COHb levels are 25 ppm for 24 hr, 30 ppm for 8 hr, and 100 ppm for 1 hr. Photochemical oxidant effects on man include acute effects (increased mortality and respiratory effects), athletic performance decreases, annoyance, and chronic effects. Expected health effects of oxidants on vulnerable groups would occur at 250 micrograms/cu m for 1 hr (increased asthmatic attacks), 200 for 1 hr (pulmonary dysfunction), and 200 micrograms/cu m for 1 hr (annoyance and eye irritation). The published data on NOx effects on human health are limited, and therefore no specific air quality guides can be established. The administrative use of air quality criteria and guides, the relationship between air pollution control costs and health protection as a criteria for decision making, the relationship between standards with different averaging times, the selection of short-term and long-term goals, and recommendations are described. Recommended long-term goals are 60 micrograms/cu m annual mean SOx concentration, 98% of the SOx observations below 200, 40 micrograms/cu m annual mean for suspended particulates, 98% of the particulate observations below 120, 10 mg/cu m 9-hour CO average, 40 mg/cu m 1-hour CO maximum, 60 micrograms/cu m 8-hour oxidant average, and 120 micrograms/cu m 1-hour oxidant maximum.

1971

36422 **APTIC NO. 59480**

Stopinski, Orin W.

NEW FEDERAL AIR QUALITY STANDARDS. *Aerospace Medical Research Lab., Wright Patterson Air Force Base, Ohio, Air Force Contract F33615-70-C-1046, Proj. 6302, Rept. No. AMRL-TR-71-120, Paper No. 17, 22p., Dec. 1971.*

NTIS, DDC: AD 751439

The bases and procedures for establishing air quality standards are considered along with proposed and final National Primary and Secondary Ambient Air Quality Standards for sulfur dioxide, particulate matter, carbon monoxide, nonmethane hydrocarbons, photochemical oxidants, and nitrogen dioxide. A discussion follows with questions and answers concerning toxicological evaluation of volatile halogenated compounds, protection of the public against air pollution, and toxicological problems associated with aircraft, missiles, and space vehicles.

1970

36423 **APTIC NO. 58681**

Dept. of Health, Education, and Welfare, National Air Pollution Control Administration

NATIONAL EMISSION STANDARDS STUDY. REPORT. APPENDIX - VOLUME 1. APPENDIXES A - E. A REPORT TO THE CONGRESS OF THE UNITED STATES BY THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE IN COMPLIANCE WITH PUBLIC LAW 90-148 CLEAN AIR ACT, AS AMENDED. (FINAL REPORT). *223p., March 1970. 209 refs.*

Five appendices are provided for a national emission standards study. The information provided relates to: descriptions of meteorological dispersion models (long and short-term models and annual and 24-hour meteorological data); the literature on health effects (effects of short-term, high-level pollutant concentrations and of long-term, low-level concentrations); control costs and control system assumptions; analysis of hypothetical national emission standards and comprehensive cost estimates for the gray iron foundries, pulp mills, the iron and steel industry, and steam-electric power plants; and a model plant procedure for the cost of compliance estimates.

LEGAL AND ADMINISTRATIVE

1974

36424 **APTIC NO. 59072**

Alm, Alvin L.

ENVIRONMENTAL PROTECTION AGENCY. (40 CFR PART 52). ARIZONA AND CALIFORNIA COMPLIANCE SCHEDULES. PUBLIC HEARING. APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. NOTICE OF PROPOSED RULE MAKING: COMPLIANCE SCHEDULES. *Federal Register, 39(44):8351-8353, March 5, 1974.*

Owners or operators of sources in Arizona and California which cannot achieve compliance with approved air pollution emission control regulations by Jan. 31, 1974 in accordance with the Clean Air Act have submitted compliance schedules to the Environmental Protection Agency for approval. Hearings on the proposed schedules will take place, and comments from the public are encouraged. Also proposed source compliance schedules for Arizona and California in accordance with their implementation plans have been clarified and changed slightly by EPA. An abbreviated list of schedules is presented. Compliance schedules can be obtained at various locations listed. Public hearings will be held on all proposed schedules, and public comment is solicited.

36425 **APTIC NO. 59339**

Chrosciel Stanislaw and Maciej Nowicki

A METHOD FOR THE OPTIMAL LOCATION OF URBAN AND INDUSTRIAL AGGLOMERATIONS. *Experientia Suppl., no 20: 169-179, 1974. 18 refs.*

A new method for the optimal location of urban and industrial agglomerations based on a pollution dose factor is proposed. The pollution dose factor allows the comparison of various pollutants in one and the same model and makes simple optimization procedures possible. Frequency of wind velocity in a sector, number of wind velocity ranges, and number of wind direction segments are also taken into account. Calculations on theoretical town model comparisons indicate that the best conditions exist in towns with linear character and proper orientation in relation to prevailing wind directions. The equivalence from the point of view of air pollution is shown for three analyzed concentric models with the commercial center in the middle and the urban and industrial districts surrounding it. The inappropriateness of the traditional settlement structure, circle or square shaped, with the industrial districts on its edges is confirmed by the fact that the mean pollution dose in this case is 75% higher than in the linear town.

36426 **APTIC NO. 58951**

Hanmer, Rebecca W.

ENVIRONMENTAL IMPACT STATEMENTS AND OTHER ACTIONS IMPACTING THE ENVIRONMENT. AVAILABILITY OF COMMENTS. *Federal Register, 39(21):3850-3852, Jan. 30, 1974.*

The Environmental Protection Agency has reviewed and commented in writing on Federal agency action impacting the environment in five appendices during the period of December 1, 1973 to December 31, 1973. Draft environmental impact statements reviewed and commented upon during the review period are listed. The definitions are given of the classifications of EPA's comments on the draft environmental impact statements. A listing of final environmental impact statements reviewed during the period is given. Proposed Federal agency regulations, legislation proposed by Federal agencies, and any other proposed actions reviewed and commented upon in writing pursuant to section 309(a) of the Clean Air Act, as amended during the referenced reviewing period, are listed. The names and addresses of the sources for copies of EPA comments listed are given.

36427 **APTIC NO. 59159**

Hartogensis, F.

THE POLICY OF ENVIRONMENTAL PROTECTION IN THE NETHERLANDS. *(Milieubeleid in Nederland). Text in Dutch. Chem. Weekblad, 70(2):11-13, Jan. 1974.*

The policy of environmental protection and its technical and economic aspects in the Netherlands are outlined. Air quality standards and regulations should be set with respect to the best practicable means available for pollution control. The adoption of the polluter pays principle, implies that polluters are required to pay the costs of the control measures appropriate to polluting action. Paying the cost of pollution does not, however, entitle any manufacturer to continue polluting.

36428 **APTIC NO. 59149**

Horvitz, Jerome S.

ASBESTOS AND ITS ENVIRONMENTAL IMPACT. *Environ. Affairs, 3(1):145-165, 1974. 80 refs.*

Health hazards of asbestos are described. Well-documented medical studies show a definite relationship between exposure to asbestos and asbestosis, lung cancer, gastrointestinal cancer, and mesothelioma. Most of the asbestos damage occurs to workers who are occupationally exposed to asbestos. The Occupational Safety and Health Act of 1970 has several provisions related to the control of asbestos dust. The permanent asbestos standard under OSHA is now 2-5 asbestos fibers/cu cm airborne exposure by 1976, which gives industry 2 more years to comply with the standard than recommended by two study committees. Standards are also set for measuring, controlling, and labelling asbestos. A suit is pending in the Court of Appeals for review of the standards. The Clean Air Act includes asbestos as a hazardous substance and promulgates a standard. A petition for reconsideration of the standard was presented to the Environmental Protection Agency in April 1973 by the Environmental Defense Fund. It points out many omissions and problems of the standard. A number of commercial uses of asbestos have been established that may result in the contamination of food, drinks, and drugs through preparation practices. Asbestos is also a water pollutant. The legal and regulatory response to the environmentally deleterious effects of asbestos contamination has been, at best, a concession to the status quo. Because of the incompleteness of medical studies and the difficulty of compiling accurate information on asbestos toxicity, there appears to be no real sense of urgency from the Federal government or industry in response to the problem. While more scientific research is being developed, there is a current need to promulgate strict laws and regulations to curb the ubiquitous use of asbestos. Since the loss of human life is the issue, the burden falls on the manufacturer to prove that his product or working condition is environmentally safe.

36429 **APTIC NO. 58837**

Kumazawa, Yasumasa

INTERNATIONAL SYMPOSIUM ON AUTOMATIC AIR POLLUTION MONITORING SYSTEM. *(Taiki osen jido kanshi shisutemu ni kansuru kokusai shinpojiumu). Text in Japanese. Kankyu Gijutsu (Environ. Conserv. Eng.), 3(1):61-69, Jan. 1974.*

Reports presented at the World Health Organization International Symposium On Automatic Air Pollution Monitoring Systems are summarized. American, Dutch, German, and Belgian air quality monitoring systems are discussed. Trends and interpretations of air pollution control are discussed. New diagramming techniques for air pollution data with regard to environmental standards are mentioned.

36430 **APTIC NO. 58508**

Kyan, Chwan P. and John H. Seinfeld

ON MEETING THE PROVISIONS OF THE CLEAN AIR ACT. *Am. Inst. Chem. Engrs. J., 20(1):118-127, Jan. 1974. 20 refs.*

A general structure is proposed for determining a set of long-term source control measures which achieve specified levels of air quality for an airshed at least cost. Such a structure is useful in evaluating alternative air pollution abatement strategies from the standpoint of air quality and total cost. The theory is applied to the problem of evaluating sets of control actions over 1973-1975 in Los Angeles. Costs of achieving various levels of air quality in Los Angeles over this period are determined. The primary pollutants in Los Angeles are nitric oxide and hydrocarbons, while air quality standards are based on atmospheric levels of nitrogen dioxide and ozone, both secondary pollutants. The least-cost control strategies were determined on the basis of air quality standards expressed in terms of the number of days/yr that NO2 and O3 concentrations exceed current primary standards (0.25 and 0.10 ppm for 1-hour averages) in downtown Los Angeles. The number of days that these standards are violated can be reduced from the estimated 1975 level of 26 and 77 days, respectively, to 10 and 50 days at a cost of approximately 70 million dollars over the 1973-1975 period. (Author abstract modified)

36431 **APTIC NO. 59294**

McCabe, J. M.

ENVIRONMENTAL IMPACT STATEMENTS ON FEDERAL AGENCY ACTIONS. AVAILABILITY OF EPA COMMENTS. *Federal Register, 39(40):7613- 7617, Feb. 27, 1974.*

Pursuant to the requirements of section 102(2) (C) of the National Environmental Policy Act of 1969 and section 309 of the Clean Air Act, as amended, the Environmental Protection Agency has reviewed and commented in writing on Federal agency actions impacting the environment contained in the following appendices during the period of January 1, 1974 and January 31, 1974. Appendix I contains a listing of draft environmental impact statements reviewed and commented upon in writing and includes the Federal agency responsible for the statement, the number and title of the statement, the classification of the nature of EPA s comments, and the EPA source for copies of the comments. Appendix II contains the definitions of the classifications of EPA s comments on the draft environmental impact statements. Appendix III contains a listing of final environmental impact statements reviewed and commented upon in writing during the review period. Appendix-IV contains a listing of proposed Federal agency regulations, legislation proposed by Federal agencies, and any other proposed actions reviewed and commented upon in writing. Appendix V contains a listing of the names and addresses of the sources for copies of EPA comments.

36432 **APTIC NO. 59297**

McGarry, Michael G.

AIR POLLUTION CONTROL IN THE DEVELOPING COUNTRY. *Experientia Suppl., no. 20:115-122, 1974. 4 refs.*

Problems associated with air pollution control in the developing countries, especially Southeast Asia, are reviewed. The polluters are most often those components of an economy upon which national development relies, and government is faced with reaching a compromise between an improved environment and strength in the commercial and industrial sectors. Inadequate education of government personnel and lack of motivation in the common urbanite who remains in relative ignorance concerning the adverse effects of pollutants also strongly contribute to the problem. Research, monitoring, and enforcement programs suffer as a consequence of insufficient expertise in the field of air pollution control; and often there is a tendency to over-simplify the content of regulations and to import environmental quality standards from the industrialized states which do not reflect the physical and social conditions of the developing country.

36433 **APTIC NO. 58458**

Quarles, John

GASOLINE VAPOR RECOVERY AND ORGANIC SOLVENT USAGE IN MASSACHUSETTS: REVISED COMPLIANCE DATES. *Federal Register, 39(28):4880-4882, Feb. 8, 1974.*

Changes in compliance dates are given for regulations pertaining to the collection of vapors displaced during the filling of storage tanks with gasoline and the filling of vehicles with gasoline in Colorado, California, District of Columbia, Massachusetts, Maryland, New Jersey, Pennsylvania, Texas, and Virginia. A change in certain compliance dates for the organic solvent usage regulation in Massachusetts is also given.

36434 **APTIC NO. 58459**

Quarles, John

TEXAS TRANSPORTATION CONTROL PLAN, EMPLOYER MASS TRANSIT INCENTIVE REGULATION. *Federal Register, 39(28):4883-4884, Feb. 8, 1974.*

Final decisions of the Environmental Protection Agency are discussed in regard to the employer incentive regulation promulgated as part of the Texas transportation control plan. The decision, public comments, and background of the proposal are discussed. The date for submission of mass transit incentive plans affected by employers (those with over 1000 employees at one location) is being changed from Feb. 1, 1974 to April 1, 1974 in response to some public comments from affected employers, in order to allow additional time to prepare adequate plans.

36435 **APTIC NO. 58460**

Quarles, John

TEXAS TRANSPORTATION CONTROL PLAN: VAPOR RECOVERY REGULATIONS: CORRECTION. *Federal Register, 39(28):4882-4883, Feb. 8, 1974.*

Two types of errors appeared in the vapor recovery regulations promulgated as part of the Texas transportation control plan on Nov. 6, 1973. This notice corrects them. The implementation plan regulation should have mentioned 80% vapor recovery from evaporative losses from the filling of vehicular tanks is required by 1976, not 90%, in El Paso. Paragraph (d) of 52.2288 and 52.2289 should have read a vapor-tight return line from the fill nozzle-filler neck interface to the dispensing tank, or to an adsorption, absorption, incineration, refrigeration-condensation system or equivalent (are acceptable to comply with the various vapor recovery regulations). The vapor was omitted in the original version of the regulation. A cross reference was added to make it clear that a displacement system may be used for vehicular vapor recovery provided it is amenable to conversion in the future.

36436 **APTIC NO. 58482**

Quarles, John

OREGON, WASHINGTON, AND GEORGIA COMPLIANCE SCHEDULES. PROPOSED APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. *Federal Register, 39(31):5503-5505, Feb. 13, 1974.*

Additional compliance schedules for Oregon and Washington as part of their implementation plans are presented. The Environmental Protection Agency is satisfied that these schedules satisfy all procedural and substantive requirements of Federal regulation 40 CFR Part 51. These schedules are listed and proposed for approval. The complete compliance schedules are available from EPA. Written comments are solicited. Certain revisions to the compliance schedule portion of Georgia s implementation plan are proposed for approval. Each revision establishes a new date by which an individual air pollution source must attain compliance with an emission limitation of the State implementation plan. The compliance schedules are available from EPA, and written comments should be sent to EPA.

36437 **APTIC NO. 58524**

Quarles, John

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. ADVANCE NOTICE OF PROPOSED RULE MAKING: EMISSION REGULATIONS FOR MEW MOTORCYCLES. *Federal Register, 39(12):2108-2111, Jan. 17, 1974.*

The Environmental Protection Agency has determined that motorcycles contribute significantly to hydrocarbon and carbon monoxide pollution in certain Air Quality Control Regions. Therefore, as part of the proposed rule making for the approval and promulgation of implementation plans for the States of Arizona, California, and New Jersey, certain limitations on the registration and operation of motorcycles were proposed. This advance notice of proposed rule-making is published to communicate to motorcycle manufacturers the course of action being considered by EPA regarding the stringency and timing of motorcycle regulations, thus providing them with the maximum possible lead time, and to seek comments from interested and affected parties on specific technical areas which impact on the development of the regulations. Specific areas in which EPA is seeking additional comment prior to proposing regulations are discussed. These include applicability, control technology, emission standards, certification, test procedures, and dynamometer design, calibration, and operation. The EPA is considering limiting exhaust emissions from 1976, 1977, and 1978 model year motorcycles to the following levels: 5 g/vehicle km (8 g/vehicle mi) for hydrocarbons; 17 g/vehicle km (28 g/vehicle mi) for carbon monoxide; and 1.2 g/vehicles km (2 g/vehicle mi) for oxides of nitrogen.

36438 **APTIC NO. 59067**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. PROPOSED REVISION TO THE NEW YORK PLAN. *Federal Register, 39(43):8175- 8176, March 4, 1974.*

The public is advised that comments may be submitted regarding a proposed New York State Implementation Plan revision that would change the final date of compliance to the Clean Air Act from Dec. 31, 1974 to Jan. 31, 1974.

36439 **APTIC NO. 59315**

Quarles, John

STATE AND LOCAL ASSISTANCE. SUBPART B--PROGRAM GRANTS. *Federal Register, 39(41):7785-7789, Feb. 28, 1974.*

Interim regulations are hereby promulgated to amend certain portions of the Environmental Protection Agency State and local assistance grant regulations (40 CFR Part 35) which pertain to air and water program grants. The amendments delete the air pollution control interstate planning grant regulations from the air pollution control program grant regulations. Major revisions to the air pollution control program grant regulations are: the regulations are now structured similar to the water program grant regulations under section 106 of the Federal Water Pollution Control Act Amendments of 1972, including output orientation; the premaintenance and maintenance concept has been eliminated; the regulations now provide for issuance of annual national air strategy guidance to the regions and States; agency programs are to be based on the State implementation plan and EPA annual guidance and are to be evaluated on achievement and effectiveness in meeting the objectives and outputs programed; and the regulations provide flexibility to the Regional Administrators for reducing grant amounts when a grantee fails to achieve outputs programed. The interim program grant regulations become effective February 25, 1974.

36440 APTIC NO. 59296

Sand, Peter H.

36441 APTIC NO. 59280

Strelow, Roger

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. FEDERAL CERTIFICATION TEST RESULTS FROM 1974 MODEL YEAR. *Federal Register, 39(40):7664-7705, Feb. 27, 1974.*

Emission levels for hydrocarbons, carbon monoxide, and oxides of nitrogen are listed for vehicles and engines representing all of the models and configurations certified as of December 31, 1973 for the 1974 model year. Emission and fuel economy data were obtained from the original emission data vehicles and engines and were adjusted by appropriate deterioration factors. All of the vehicles and engines listed conform to Federal emission standards for the 1974 model year.

36442 APTIC NO. 59311

Strelow, Roger

GUIDELINES FOR DESIGNATION OF AIR QUALITY MAINTENANCE AREAS. *Federal Register, 39(38):7196-7197, Feb. 25, 1974.*

Copies of the Environmental Protection Agency s Guidelines for Designation of Air Quality Maintenance Areas are now available for inspection in State Air Polluton Control Offices, EPA Regional Offices, and the Freedom of Information Center, EPA, 401 M Street, SW Washington, D. C. The guidelines are to assist State agencies in identifying areas which they propose, after public hearings, to designate as Air Quality Maintenance Areas. These areas are identified as having the potential of exceeding air quality standards between 1975 and 1985.

36443 APTIC NO. 58838

Takahashi, Toru

PRESENT STATE OF ODOR NUISANCE AND ITS CONTROL MEASURES. *(Akushu kogai no genjo to taisaku). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 3(1):55-57, Jan. 1974.*

In 1971, 17,750 complaints about odors were received. These complaints comprise 23.3% of all public nuisance complaints and have increased five-fold since 1966. Tokyo has the largest percentage of complaints, followed by Osaka, Aichi, Saitama, and Mie in that order; however, there does not seem to be any relation between the size of the area and the number of complaints received. Under the Odor Control Law, 29 prefectures have had odor controlled districts designated in them. Odors, except for ammonia, are measured by gas chromatography. Only five substances, including NH_3 and methyl mercaptans are subject to restrictive legislation. Studies have been made on the advisability of restricting fatty acids, aldehydes, and amines.

36444 APTIC NO. 58362

Train, Russell E.

ENVIRONMENTAL PROTECTION AGENCY. (40 CFR PART 52). DISTRICT OF COLUMBIA. PROPOSED APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. PROPOSED COMPLIANCE SCHEDULES FOR SOUTH CAROLINA. *Federal Register, 39(8):1641-1642, Jan. 11, 1974.*

A proposed revision to the control strategy for particulate matter of the District of Columbia implementation plan is described. Compliance schedules are given for the South Carolina state implementation plan.

36445 APTIC NO. 58363

Train, Russell E.

SOURCE EMISSION REGULATIONS: TENNESSEE. APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. *Federal Register, 39(3):1063-1064, Jan. 4, 1974.*

Tennessee has proposed specific limitations as requirements for existing sources in the categories of asphalt plants, cotton gins, and kraft mills as revisions to its implementation plan. Comments on the revisions to its implementation plan. Comments on the revisions may be submitted to the Environmental Protection Agency.

36446 APTIC NO. 58476

Train, Russell E.

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. PROPOSED COMPLIANCE SCHEDULES FOR FLORIDA. *Federal Register, 39(33):5791-5793, Feb. 15, 1974.*

Additional compliance schedules to the Florida State implementation plan are proposed. Each proposed schedule establishes a date by which an individual air pollution source must attain compliance with an emission limitation of the implementation plan. This date is the final compliance date. Written comments on the proposed compliance schedules are solicited.

36447 APTIC NO. 58479

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. REVISIONS TO ILLINOIS, INDIANA, MICHIGAN, MINNESOTA AND WISCONSIN. *Federal Register, 39(34):6126-6130, Feb. 19, 1974.*

Substitute source compliance schedules for the State implementation plans of Illinois, Indiana, Michigan, Minnesota, and Wisconsin are given. The sources, locations, regulations involved, dates schedules were adopted, and final compliance dates are listed.

36448 APTIC NO. 58481

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. PROPOSED REVISION TO STATE OF VIRGINIA IMPLEMENTATION PLAN. *Federal Register, 39(30):5324, Feb. 12, 1974.*

Receipt is acknowledged and public comment is requested on a proposed change in the Virginia State implementation plan. The amendments would expand the procedures for review of buildings or other facilities prior to construction or modification in order to include consideration of the air quality impact not only of pollutants emitted directly from stationary sources, but also of pollution arising from mobile source activity associated with such buildings or facilities (termed indirect sources).

36449 APTIC NO. 58483

Train, Russell E.

NEW HAMPSHIRE. PROPOSED REVISION TO IMPLEMENTATION PLAN. *Federal Register, 39(29):5198-5199, Feb. 11, 1974.*

A proposed revision to the New Hampshire State implementation plan is described, and comments are solicited. The revision would allow the use of 2% sulfur content number five and six fuel oil until Oct. 1, 1974 and use of 1 and 1.5% fuel after that date, except in the Androscoggin Valley Air quality Control Region where 2.2% sulfur five and six fuel oil may be burned. There will be no problem maintaining the sulfur oxide air quality standards if this revision is approved.

36450 **APTIC NO. 59351**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. REVISIONS TO WASHINGTON IMPLEMENTATION PLAN. *Federal Register, 39(39):7433, Feb. 26, 1974.*

Submitted revisions to the Washington Administrative Code, chapters 18-40 (Suspended Particulates), 18-12 (Open Burning), and 18-04 (General) plus a new chapter, 18-06 (Sensitive Areas) have been reviewed by the Environmental Protection Agency administrator and are consistent with the approved implementation plan. The amended chapter 18-04 provides for adoption of a generalized compliance schedule for all sources subject to future effective standards in the regulation, and the new chapter 18-06 sets more stringent requirements than those contained in the general regulation for wigwam burners in designated sensitive areas.

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36451 **APTIC NO. 58715**

Akland, Gerald G., Thomas C. Lawless, Stephen K. Goranson, and S. David Shearer

DEVELOPING A DATA HANDLING SYSTEM FOR STORAGE AND RETRIEVAL OF DATA RESULTING FROM WHO AND WMO GLOVAL MONITORING NETWORKS. *Preprint, World Meteorological Assoc. and World Health Organization, 15p., 1973. 5 refs. (Presented at the World Meteorological Organization/World Health Organization Technical Conference on Observation and Measurement of Atmospheric Pollution, Helsinki, Finland, July 30-Aug. 4, 1973.)*

The data handling system designed to process the data resulting from the WHO international Air Pollution Monitoring Networks and the WMO Precipitation Monitoring Newwork is discussed. Summary statistics are produce that permit international comparisons and interpretations of levels and trends of various pollutants found in ambient air or precipitation. Methods for recording information about the site and sampling and analysis techniques are standardized so that the resulting summaries are comparable within pollutant method. (Author abstract modified)

36452 **APTIC NO. 59092**

Bartolo, A. M.

POLLUTION CONTROL SYMPOSIUM. *Sugar Ind. Technol., vol. 32:173-176, May 13-16, 1973. (Presented at the Pollution Control Symposium, S.I.T. Paper 366A.)*

Legislation, sources, and pollutants in air and water pollution are reviewed with respect to the sugar industry. Yearly air pollution emission inventories must be submitted to the Air Control Board. The Board designates air quality control regions and limits emissions according to an alert system. Boiler stack emission reports can be calculated by determining emission factors, actual emissions, and chemical composition by weight for various emissions. Typically, a medium size sugar refinery can emit 125.4 tons/yr nitrogen oxides, 1.15 sulfur oxides, 44.22 hydrocarbons, 0.3 carbon monoxide, 16.21 particulates, and 2.95 aldehydes.

36453 **APTIC NO. 59281**

Broadbent, D. H.

ENVIRONMENTAL ISSUES IN THE MANAGEMENT OF A PUBLIC INDUSTRY. *Atmos. Environ., 7(12):1199-1204, 1973.*

Future energy supplies and the environment of the United Kingdom are discussed. It is assumed that more energy per capita will be needed, but exponential growth of demand seems likely to be arrested by more efficient use. New technologies and developments which will effect the energy scene in the U. K. include: thermal efficiency of power stations, using refuse and waste, recycling metals, transport, utilization of energy, and primary fuel consumption.

36454 **APTIC NO. 59276**

Cocude, M.

REGULATIONS CONCERNING STATIONARY COMBUSTION EQUIPMENT WITH RESPECT TO AIR POLLUTION. *(La reglementation des installations fixes de combustion au titre de la pollution atmospherique). Text in French. Rev. Gen. Thermique (Paris), 12(142):1055-1058, Oct. 1973. 11 refs.*

Regulations imposed on industrial and domestic combustion equipment to abate pollutant emissions are surveyed. Minimum stack height and minimum rate of discharge (2 m/sec) are prescribed for solid and liquid fuel-firing equipment with capacities exceeding 1000 thermal units/h. To maintain the annual average sulfur dioxide concentration at or below a limit value of 0.250 mg/cu m, the specific sulfur emission is limited to 2 g/thermal unit. Fuel oil No. 1 and fuel Oil No. 2 are permitted in protection zones for use in combustion equipment with capacities of less than 500 and 1000 thermal units/h, respectively. The combustion of wastes, turf, and lignite is prohibited in protection zones. Proper heat insulation is regarded as one of the essential means of pollution abatement.

36455 **APTIC NO. 59135**

Daessler, Hans Guenther

AIR POLLUTION AND CLEAN AIR MAINTENANCE IN INDUSTRIAL AND URBAN AGGLOMERATIONS. *(Belastung und Reinhaltung der Atmosphaere in Ballungsgebieten). Text in German. Wiss. Z. Tech. Univ. Dresden, 22(4):629-631, 1973. 1 ref.*

General problems of air pollution, and possibilities of clean air maintenance in the industrial and urban agglomerations of East Germany are discussed. The increasing agglomeration and concentration of industrial and urban complexes produces a corresponding concentration of pollutant emissions from industrial, domestic and traffic sources, which threatens human and animal health, damages vegetation, and damages metal and nonmetal surfaces, as well as buildings. Air pollution in such agglomerations may be especially critical during inversion periods. The proper siting of industrial and residential complexes, the establishment of safety zones and green belts between adjacent industrial and urban agglomerations, the development of environmentally acceptable technologies, the use of natural gas and desulfurized fuel oil, and improved traffic planning for optimum ventilation are the basic means of abating air pollution in urban and industrial agglomerations.

36456 **APTIC NO. 59117**

Dreyhaupt, F. J. and H. Bresser

PRACTICAL APPLICATION OF THE DISPERSION CALCULATION TO THE STANDARDIZATION OF BUFFER ZONES BETWEEN INDUSTRIAL EMISSION SOURCES AND RESIDENTIAL AREAS. *(Praktische Anwendung der Ausbreitungsrechnung zur Normierung von Schutzabstaenden zwischen emittierender Industrie und Wogngebieten). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 200:199-215, 1973. 9 refs.*

One of the most important factors in air pollution control in town and regional planning is the fixation of distances between industrial areas and residential areas. In the USSR, Poland, and Israel, buffer-zone lists are officially used. In North-Rhine Westfalia, a provisional buffer-zone list for the assistance of the factory inspectors has been set up. But all the buffer-zone lists used today are based on empirical experience. A comparison of the lists shows considerable differences, so it is necessary to apply scientific methods for defining protective distances. Normalized protective distances can be calculated by using diffusion models, standard emission inventories, and standard meteorological conditions for defined regions. Air quality standards are preset which are characterized by a permissible exceeding frequency. This method is demonstrated by an example.

36457 **APTIC NO. 59266**

Easterling, Mahlon

PERIODIC MOTOR VEHICLE INSPECTION AS A SMOG ABATEMENT MEASURE IN THE SOUTH COAST AIR BASIN. *California Inst. of Tech., Environmental Quality Lab., Memo 2, National Science Foundation Grant GI-29726, 30p., Jan. 1973. 5 refs.*

Measurements are outlined for periodic motor vehicle inspection as a smog abatement procedure for the California south coast air basin. Desirable features of a mandatory inspection and maintenance system outlined include: performance of the inspection by the state (or a state supervised not-for-profit organization), performance of maintenance by whomever the owner of the vehicle chooses, the establishment of a vehicle registration dependent on inspection passage, arrangement of an inspection procedure which allows for any vehicle in reasonably good operating condition to pass and which provides diagnostic information to aid in the repair, initiation with a pilot program in Los Angeles devoted to light duty vehicles, the combination of safety-inspection programs with emission inspections, and the inclusion of vehicles using fuels other than gasoline into the system.

36458 **APTIC NO. 59069**

Egmond, N. D. van

MONITORING SYSTEMS FOR AIR POLLUTION IN THE NETHERLANDS. *Tribune CEDEDEAU (Centre Belge Etude Doc. Eaux), 26(361):510-514, Dec. 1973.*

The objectives, strategy, and structure of air quality monitoring systems in the Netherlands are discussed. The stations measure ground level concentrations of nitrogen oxides, carbon monoxide, ozone, hydrocarbons, and sulfur dioxide, as well as meteorological factors such as wind in both rural and urban areas. Data can be used to gather emission inventories, data about diffusion and transport of pollution, or local air quality information. The National Measuring Network consists of measuring stations, regional centers equipped with data handling units, and a national center which centrally coordinates the system. These stations and centers are described.

36459 **APTIC NO. 58973**

Folz, J. M.

MONITORING AND ALARM NETWORK FOR THE PREVENTION OF AIR POLLUTION IN THE ROUEN AGGLOMERATION. *(Le reseau de surveillance et d alarme pour la prevention de la pollution atmospherique dans l agglomeration rouennnaise). Text in French. Ann. Mines (Paris), Nov.-Dec. 1973:115-122, 1973.*

The air pollution monitoring and alarm network installed in the Rouen agglomeration (France) is described. The network is composed of automatic continuous measuring stations for sulfur dioxide, nitrogen oxides, and dust. The network is completed by instruments measuring the meteorological parameters, such temperature distribution in altitude, wind speed and wind direction. The data fed into a central computer permit forecasting hazardous pollution situations as a function of the prevalent meteorological conditions, in which cases the major sources of air pollution are required to abate their emissions, e.g., by the use of low-sulfur fuel, and by stepping down production. An alarm is given automatically whenever the SO2 concentration exceeds 1 mg/cu m as measured at one sampling station; or 0.8 mg/vu m as measured simultaneously at two stations, or 0.8 mg/cu m and 0.6 mg/cu m dust measured simultaneously at two stations.

36460 **APTIC NO. 58395**

Hashimoto, Michio

RECENT ENVIRONMENTAL PROBLEMS. *(Saikin no kankyo mondai). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 20(11):647-650, Nov. 1973.*

After a general discussion of various types of environmental pollution, the compensation methods for pollution victims are briefly discussed. The compensation of pollution victims was started in Yokkaichi in 1965, but the legislature for public compensation measures was passed only in 1969. The reimbursement was for the cost of health treatment and medical fees, plus a small amount of individual allowance, but there was no compensation allowance for the loss of potential income for the victims and their families. More recently, bills were proposed to include compensations for bereaved families for the temporary and long-term expenses, along with compensation for the children of victims. The methods for determination of recipients of these compensations and the sources for funds are discussed.

36461 **APTIC NO. 58843**

Hoegger, D.

CLEAN AIR MAINTENANCE AND MAXIMUM ALLOWABLE CONCENTRATIONS. *(Reinhaltung der Luft und Immissionsgrenzwerte). Text in German. Chimia, 27(10):545-550, Oct. 1973.*

General problems and significance of air pollution monitoring and of air pollution standards are described. While total elimination of air pollution is both technically and economically impossible, the air should be maintained as clean as possible, and at least be prevented from becoming more polluted in the future. To achieve this, air pollution monitoring is necessary for the evaluation of clean air maintenance and emission control measures taken, for the forecast of possible air pollution catastrophes, and for the assessment of the general trend of air pollution. Since it is impossible to monitor all pollutants everywhere continuously, certain pollutants, such as sulfur dioxide and carbon monoxide, should be given priority, and monitoring should be conducted on representative sites. In addition, it is not necessary to conduct continuous monitoring for certain air pollutants. While monitoring should furnish primarily averaged, mean values for extended periods, also maxima of pollutant concentrations should be obtained. Except for a few cases, e.g., carbon monoxide and lead (blood tests), it is impossible to correlate the measured pollutant concentrations to the actual exposure.

36462 **APTIC NO. 585510**

Inoue, Tsutomu, Makoto Tani, Takehiko Takemoto, and Shoji Kurata

AIR POLLUTION CONTROL IN NISHIYODOGAWA-KU AREA. *(Osaka-shi, Nishiyodogawa ku tokubetsu taisaku ni tsuite (II)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):509, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 239.)*

As of November 1971, specially designated plants and factories in the Nishiyodogawa district of Osaka were requested to use fuel containing less than 1% of sulfur; as of December 1972, 41 plants and factories were requested to use fuels containing less than 0.8% of sulfur. Four factories installed stack gas desulfurization systems; according to the municipal environmental bureau s advice, 11 factories were relocated or closed; installation of various dust collectors, and the changes of manufacturing process and machinery to those without dust and soot creation were advised. As a result of these special control plans, the 1972 sulfur oxide concentration average was reduced to less than 0.05 ppm. For the achievement of the new maximum allowable environmental standard of May 1973, reduction of nitrogen oxide and photochemical oxidants emissions will be necessary. At the present time, Osaka municipality is revising the Clean Air Plan.

36463 **APTIC NO. 58408**

Kirk, Alan G., II

NEVADA AIR QUALITY IMPLEMENTATION PLAN. NOTICE OF PUBLIC HEARING. *Federal Register, 38(236):34020-34022, Dec. 10, 1973.*

A notice of a public hearing for the amendment of Articles 4, 7, and 8 of the Nevada Air Quality Implementation Plan is presented. Article 4 provides for regulations of emissions from stationary sources. Article 7 deals with particulate matter from industrial sources. Article 8 provides for sulfur emissions from primary non-ferrous smelters.

36464 **APTIC NO. 58360**

Kohn, Robert E. and Eric Weger

POLLUTION CONTROL BY LOCATIONAL CHANGE AND TECHNOLOGICAL ABATEMENT. *J. Air Pollution Control Assoc., 23(12):1045-1047, Dec. 1973. 8 refs.*

The relative importance of abatement and locational changes on the decline of sulfur dioxide concentrations in St. Louis was investigated. A simple diffusion model was used to relate annual average concentrations to annual emission data. Had there been no abatement activity, the changes in location of sources that occurred between 1963 and 1970 have more or less offset a 40% increase in annual emissions over that period. However, the abatement activity, essentially the consequences of air pollution regulations, may possibly be credited with a decline of 35% in the annual average concentration. (Author abstract modified)

36465 **APTIC NO. 59071**

Markusch, H.

THE AIR QUALITY MEASUREMENT SYSTEM IN FRANKFURT. *Tribune CEBEDEAU (Centre Belge Etude Doc. Eaux), 26(361):515-516, Dec. 1973. 3 refs.*

The history, use, and results of the air quality measurement system in Frankfurt are discussed. The system measures carbon dioxide, carbon monoxide, sulfur dioxide, nitrogen oxide, hydrocarbon, hydrogen sulfide, and particulate concentrations as well as meteorological data such as wind, temperature, humiditiy, pressure, and net radiation. The measuring instruments are tied in with a computer for control and data analysis. The computer calibrates and checks the data. In case of current failure, the computer stores all values just handled, and then if the current comes on again the computer starts itself and computes the data.

36466 **APTIC NO. 58421**

Nishida, Minoru, Takashi Kimura, Yasushi Tahara, Hiroshi Suyama, Tadafumi Tsuchida, Yutaka Yoshida, Teruo Nishijima, and Kaoru Sumiyoshi

AIR POLLUTION CONTROL FOR THE EASTERN AREA OF OSAKA. *(Osaka-shi tobu chiiki tokubetsu taisaku ni tsuite (I)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):508, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 238.)*

In the eastern part of the Osaka industrial area, the standards have been extremely lenient compared to the western coastal area and the middle area; consequently, sulfur oxide emission quantity in that area has been extremely high in relation to the amount of fuel consumption. It was decided that the same fuel regulations for the other two areas would be applied to eastern Osaka in order to reduce the amount of SOx emission. Group guidance sessions were held by industrial classifications, and adherence to special emission standards and installation standards were requested. The total number of complaints for toxic emissions and odors in Osaka is 974 cases per year, and 490 come from the eastern section. In the future, more stringent regulations will be enforced for both air pollution and odor.

36467 **APTIC NO. 58407**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. BALTIMORE, MARYLAND TRANSPORTATION CONTROL PLAN. *Federal Register, 38(238):34240-34257, part 2, Dec. 12, 1973.*

A transportation control plan for the Metropolitan Baltimore Intrastate Air Quality Control Region (AQCR) is presented. The plan seeks to control carbon monoxide and photochemical oxidant emissions. There are provisions for an inspection and maintenance program; a device for vacuum spark advance disconnect retrofit; an oxidizing catalyst retrofit for vehicles in Baltimore; a light duty air/fuel control retrofit program; a heavy duty air/fuel control retrofit program; gasoline transfer vapor control; carpool commuter matching system; employer s provision for mass transit priority incentives; the study and establishment of bikeways in the Baltimore area; the control of dry cleaning solven evaporation; exclusive bus lanes for Baltimore suburbs and outlying areas; regulations for limitation of public parking; gasoline limitations; management of parking facilities; and the control and prohibition of sources of photochemically reactive organic materials.

36468 **APTIC NO. 58492**

Quarles, John

CALIFORNIA TRANSPORTATION CONTROL PLAN. APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. *Federal Register, 38(237):34124- 34126, Dec. 11, 1973.*

The approval and promulgation of amendment of five regulations contained in the California transportation control plan are presented. The regulations would establish a comprehensive program to reduce automobile traffic in the three most heavily polluted California Air Quality Control Regions through the control of practically all existing and future parking spaces. Two of them would apply in all five Regions covered by the plan. The basic means of regulation would be surcharges imposed on all free and commercial parking spaces by relevant local government, and on non-carpool employee parking by the relevant employer. A permit would be required to construct any new parking facility over 50 spaces. All surcharges would be collected either by the relevant local government or the relevant employer. All net revenues over and above the cost of collection would be spent on improving mass transit.

36469 **APTIC NO. 59350**

Quarles, John

KANSAS IMPLEMENTATION PLAN. APPROVAL OF PUBLIC HEARING PROCEDURES. *Federal Register, 38(239):34361, Dec. 13, 1973.*

The Environmental Protection Agency administration has determined that the Kansas procedures for notice of public hearings in regard to implementation plans, although different from the requirements of 40 CFR 51.4(b), provide for adequate notice to and participation by the public as consistent with Section 110 of the Clean Air Act. The Kansas procedures are thus approved upon the condition that notice under such procedures shall be not less than 25 days prior to the date of any hearing and that the record of any such hearing shall be kept open for public comment for at least 30 days from the date of the notice.

36470 **APTIC NO. 58550**

Sako, Shigeru, Yasuo Yagi, Fujihiko Go, and Akihiko Yoneda

DECREASE OF SULFUR OXIDES BY FUEL OIL CONTROL AND ANNUAL CHANGE OF SULFER OXIDES CONCENTRATION IN OSAKA. *(Osaka-fu ni okeru io sankabutsu taisaku to kankyo nodo no suii). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):510, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 240.)*

The administrative guidance policy, or The Blue Sky Plans, for Osaka prefecture is described. A large-scale pollution control for the reduction of total emission quantities must be carried out in order to maintain the less than 0.05 ppm sulfur oxide concentration. The original Blue Sky Plan is now revised to read that the 18 factories which contribute to the more than 0.05 ppm yearly average of SOx must control the ground concentration to less than 0.2 pphm maximum (annual average); medium and small pollution sources which consume more than 2 k/mo fuel or more than 500 l/hr of the total burner capacity (335 factories) must use less than 1% of sulfur content fuel in the Nishi-Yodogawa district of Osaka; other factories in 17 cities and one township of Osaka prefecture must use less than 1.7 sulfur content fuel. The yearly average of SOx emission concentration in the city of Osaka reduced drastically between 1971 and 1972, and now all yearly averages of SOx for Osaka, Sakai, and other areas are less than 0.05 ppm.

36471 **APTIC NO. 58415**

Satsutani, Taishi and Yoshihiro Tsunoda

OBSERVATION OF ATMOSPHERIC IONS AND PHOTOCHEMICAL SMOG. *(Taiki ion kansoku to kokagaku sumoggu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):433, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 177. 2 refs.)*

The measurements of atmospheric ions on the days of photochemical smog in Kobe were studied. The fluctuations appearing on four ion meters on Sept. 4, 1972 and June 14, 1973 were compared. On these days, minor physical damages occurred on children in high school and junior high school playgrounds. On both days, extremely high total minus ions (6000-7000/cu cm) appeared between 1-3 pm. The patterns seem to be: a decrease of minimum ion and middle ion averages, an increase of medium ion temporarily, and an increase of total ion, and minute fluctuations in the aerial local electric potentials on the days of photochemical smog formation.

36472 **APTIC NO. 58409**

Train, Russell

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. MASSACHUSETTS: APPROVAL OF PLAN REVISIONS. *Federal Register, 38(237):34116-34117, Dec. 11, 1973.*

The amendments to the plan for implementation of the national ambient air quality standards in Massachusetts are presented. The proposed revision would relax the sulfur content of number two fuel oil from 0.3 percent to 0.5 percent from Nov. 15, 1973 to April 15, 1975 by amending regulation 5.1.3 of the regulations as amended for the Control of Air Pollution in the six Massachusetts Air Pollution Control Districts.

36473 **APTIC NO. 58406**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. MISCELLANEOUS AMENDMENTS. *Federal Register, 38(236):33973, Dec. 10, 1973.*

Rule 68 of the Los Angeles County Air Pollution Control District is added to the list of local regulations for which affected sources in the State of California must submit compliance schedules. Rule 68 limits oxides of nitrogen emissions from any non-mobile fuel burning article, machine, equipment or other contrivance, having a maximum heat input of more than 1775 million BTU per hr.

36474 **APTIC NO. 58323**

Japan Chamber of Commerce, Tokyo, Bureau of Industrial Pollution Information

REPORT ON ACTIVITIES OF THE BUREAU OF INDUSTRIAL POLLUTION INFORMATION. *(Sangyo kogai sodanshitsu jigyo hokokusho). Text in Japanese. Tokyo, Japan, 29p., Sept. 1973.*

The total of 114 consultations were given on air pollution-related matters at various branch offices of the Japan Chamber of Commerce in Sept. 1973; 49 cases were on technical matters, 29 on legal, 10 on financial, two on tax, six on relocation, eight on pollution control equipment, and 10 on other related subjects. The ratio of air pollution consultations to the total number of public nuisance consultations was 18.1% and was much lower than noise (28.4%), or water pollution (22.4%), and others including soil pollution (47.5%), but more than bad odor, vibration, or industrial waste problems. The contents of advices included the cause for quantitation fluctuations of iodimetric analysis, bag filters, and bad odor caused by coating material. Thirteen cases were in Osaka, 11 in Hamamatsu, and 10 in Kawasaki. Only two advices were sought for in Tokyo.

36475 **APTIC NO. 58488**

CALIFORNIA TRANSPORTATION CONTROL PLAN. CORRECTION. *Federal Register, 38(240):34464, Dec. 14, 1973.*

A correction in the publication of the California Transportation Control Plan is presented. Page 31232 of the Federal Register of Nov. 12, 1973 is corrected to read: Whether the National Ambient Air Quality Standard (NAAQS) for oxidant of 0.08 ppm for a 1-hour average time is an appropriate standard; and if a socially disruptive measure such as extensive gasoline rationing is required to meet the NAAQS s for oxidant and carbon monoxide by 1977, whether the attainment date should be delayed beyond 1977.

36476 **APTIC NO. 59085**

AIR QUALITY MONITORING IN BADEN-WUERTTEMBERG. *(Luftueberwachung in Baden-Wuerttemberg). Text in German. Computer Praxis, 5(10):A314, Oct. 1973.*

The complex air quality monitoring network of 14 stations, being built in Baden-Wuerttemberg, is described. The individual stations will be equipped for the systematic measurements of such parameters as solar radiation, wind speed, wind direction, air temperature, pressure, and humidity, as well as hydrocarbon, carbon monoxide, carbon dioxide, sulfur dioxide, nitrogen oxide, ozone, and dust concentrations. The future incorporation in the stations of chromatographs for the measurement of individual organic components is envisaged. All stations will be connected to either of two computer subcenters in Mannheim and Stuttgart for data processing, including averaging of the measurement data. A main center in Karlsruhe will release alarms in the framework of a smog alarm system.

36477 **APTIC NO. 59088**

HEALTH LAWS AND REGULATIONS. *Intern. Digest Health Legislation, 24(3):568-570, 454-456, 469, 471-475, 481, 582-584, 636, 1973.*

Various laws of the Netherlands are reviewed for the control of air pollution, including those establishing installations to be controlled, licensing procedures, and date of laws. Australian laws mentioned include miscellaneous provisions of various regulations, occupational diseases, emission standards for motor vehicles, establishment of an Air Pollution Control Board, the Clean Air Act, emission standards, and formation of an Environmental Protection Council. A Belgium regulation is reviewed for the establishment of special environmental protection areas. Polish laws are listed for the establishment of departments for land use and enviromental protection and for regulation the maximum permissible concentrations of harmful substances in the ambient air. A Scottish law controlling the discharge of noxious and offensive gases is also listed.

36478 **APTIC NO. 59200**

Committee on Public Works (U. S. Congress), Subcommittee on Air and Water Pollution

THE FUEL STORAGE AND THE CLEAN AIR ACT. *93rd Congress (Senate), First Session, S.2680, Serial 93-H26, 113p., Nov. 12, 1973. (Hearing before the Subcommittee on Air and Water Pollution.)*

GPO

Legislation S.2680 to amend the Clean Air Act is presented which would facilitate the Administrator of the Environmental Protection Agency s ability to grant variances from clean air requirements to deal with fuel shortages. This bill, like the variances it authorizes, is for a limited duration -- only 6 months. Since the fuel crisis may be longer, the Administrator is provided with new authority to act to accelerate changes in Clean Air Act implementation plans. The bill would permit extension of final compliance dates until 1977 to give utilities and industries necessary time to install available stack gas emission controls and to switch fuels. The President must also determine the availability of low-sulfur fuels and alternative fuel resources. Statements are given by various Senators, members of EPA, environmental protection group members, and other experts.

36479 **APTIC NO. 59285**

Japan Chamber of Commerce, Tokyo, Bureau of Industrial Pollution Information

REPORT ON ACTIVITIES OF BUREAU OF INDUSTRIAL POLLUTION INFORMATION, OCTOBER 1973. *(Sangyo Kogai Sodanshitsu jigyo hokokusho). Text in Japanese. 33p. Oct. 1973.*

The activities of various branches of the Japan Chamber of Commerce, Bureau of Industrial Pollution Information for October 1973 included 110 cases on air pollution and 20 cases on odor; these numbers represented 14.1% and 2.8% respectively of all types of consultations. Of the 110 cases, 52 were on technical matters, 29 on legal matters, six on finances, 16 on control equipment, and seven on others. Consultations on technical matters included the selection of boiler flue gas dust collection and desulfurization systems, methods for treatment of hydrocarbons emitted by printing plants, and selection of stack gas control either by a high stack or a flue gas desulfurization system. Advice on the designing and installation of adsorption tower for odors emitted by the dryer for the paint coating of switchboards was given. Controls for odors emitted by the incineration of automotive parts repair paint and oil varnish are discussed. Stack gas collection hoods, jet scrubbing, and filters with activated carbon were recommended; when this was unsatisfactory, the use of neutralizer was suggested.

1972

36480 **APTIC NO. 58667**

Meadows, Dennis L. and Jorgen Randers

ADDING THE TIME DIMENSION TO ENVIRONMENTAL POLICY. *In: World Eco-Crisis: International Organizations in Response. David A. Kay and Eugene B. Skolnikoff (eds.), Madison, Wis., University of Wisconsin Press, 1972, p. 47-66. 7 refs.*

To study the time characteristics of pollution control programs the DDT and solid waste problems were studied. Two time characteristics were found: the costs of pollution must be borne for periods much longer than the period of benefit derived from the polluting activity; and there may be a delay of ten years or more between the implementation of a policy and its first obvious benefits. If corrective action is postponed until the actual costs of pollution are unacceptable, there may no longer be an opportunity to avoid sustained penalities. Both of these characteristics are the result of long delays in the process which govern the transfer of materials through the environment. Delays of the magnitude found in the above studies are inherent in the transfer and impact of many materials causing environmental deterioration. Current decisions must be based on the anticipated consequences of current action rather than on the perceived costs of past actions. Institutions must develop the capabilities to: monitor pollution release rates as well as absolute levels in the environment; develop and employ models which can relate current pollutant release rates and alternative future abatement policies to the levels of environmental pollution they will produce in the future; and devise biological testing procedures and ecological experiments well in advance to provide the factual basis for relating projected pollution levels to the future biological damage they will produce. If environmental institutions are structured so that they are subject to the same short-term pressures as most current institutions, they cannot be expected to succeed in stopping environmental deterioration.

36481 **APTIC NO. 59172**

Paffrath, D.

RESEARCH WORK OF THE DFVLR IN THE FIELD OF ENVIRONMENTAL PROTECTION. PART I: AIR CLEANLINESS. *(Forschungsarbeiten in der DFVLR auf dem Gebiet des Umweltschutzes. Teil I: Reinhaltung der Luft). Text in German. Deutsche Forschungs - und Versuchsanstalt fuer Luft - und Raumfahrt, Oberpfaffenhofen (West Germany), Inst. fuer physik der Atmosphaere, DLR Mitt. 72-14, 93p., 1972. 59 refs.*

NTIS: N73-31584

Activities of the institutes and facilities of the DFVLR (Deutsche Forschungs und Versuchsanstalt fuer Luft- und Raumfahrt) are presented. Investigations are being performed on the emissions of propulsion engines, remote sensing and sampling of air pollution, meteorological aspects of air pollution, problems of boundary layers and turbulence, and diffusion and distribution of air pollution in the atmosphere.

36482 **APTIC NO. 58759**

Paterson, M. P. and R. S. Scorer

A NEW EVALUATION OF AIR POLLUTION SURVEYS. *Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 7p. 4 refs. (May 3-5.)*

The uses of various air pollution surveys are discussed. Local meteorology and the purpose of the survey can change the results. Some surveys measure tree and material damage, while others rely on measuring sulfur dioxide. The traditional air pollution survey is reviewed. Traditional surveys cannot be used to acquire data which is now demanded, therefore new surveys are being used for studies of synergism, urban pollution, international pollution caused by transport of pollution across national boundaries, and other problems.

36483 **APTIC NO. 59516**

Selamoglu, Suha

ON THE SELECTION OF SITES OF AIR POLLUTION SAMPLING STATIONS. *North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Modeling, 3rd Meet., Paris, France, 1972, p. XII-1-XII-6. 1 refs. (Oct. 2-3.)*

A mathematical model is presented for the selection of air pollution sampling station sites in a manner such that an optimum distribution may be obtained by way of comparisons among various geographical distributions of stations. The model accounts for the fact that different distributions will arise from different considerations pertaining to the use of the measurement data and the nature of the pollutants being examined. A weight function is presented which may be modulated at will, depending on the mode of use of the model-estimated data.

36484 **APTIC NO. 58871**

Tamplin, Arthur R.

A PROPOSAL FOR A RATIONAL POLICY TO CONTROL RADIOACTIVITY AND OTHER FORMS OF POLLUTION. *In: The Environmental and Ecological Forum 1970-1971. Atomic Energy Commission UC-2, TID-25857, p. 87-91, 1972.*

The effects of various pollutants on humans include toxic and synergistic effects. There are many uncertainties in the effects of radioactivity and other pollutants, which make it impossible to measure their exact costs. As long as there are no laws, pollution will occur without regard to risks and benefits. Risk-benefit calculations can be used to make decisions regarding pollution. Nuclear plant benefits and effects are mentioned. To properly protect public health and safety, laws should read that the acceptable limit of pollution is zero and that the privilege of releasing a pollutant must be negotiated. The prospective polluter should demonstrate that his activity will produce benefits to those affected that outweigh the risk.

36485 **APTIC NO. 58873**

Tydings, Joseph D.

THE NUCS: ENERGY VS. THE ENVIRONMENT. *In: The Environmental and Ecological Forum 1970-1971, Atomic Energy Commission UC-2, TID-25857, p. 51-56, 1972.*

The problems of nuclear power plant development, legislation, safety, and environmental effects are generally discussed. A U. S. bill is discussed to give the Atomic Energy Commission the authority to grant or deny licenses on the basis of the environmental impact which the proposed nuclear facility would have. The problem of meeting energy requirements and at the same time protecting the environment is reviewed. It is proposed that individual states should be able to set water and air quality standards which could not be exceeded by the Atomic Energy Commission.

36486 **APTIC NO. 58866**

Wilk, I. J.

AIR POLLUTION, POLITICS, AND CHEMISTS. *Preprint, American Chemical Society, Div. of Water, Air, and Waste Chemistry, 4p., 1972. 24 refs. (Presented at the American Chemical Society, National Meeting, 163rd, Boston, Mass., April 1972.)*

The role of scientists in the control of environmental problems is emphasized in a discussion of the organization of the Motor Vehicle Pollution Control Board of California. The scientists on the Board have stressed the importance of controlling emissions of nitrogen oxides. They correctly predicted that certain modifications in the operations of automobile engines, while reducing hydrocarbon and carbon monoxide emissions, cause an increase in NOx emissions. Automobile manufacturers argued that ozone levels and therefore photochemical smog were reduced by nitrogen dioxide and nitric oxide emissions. The data indicate that in the presence of moisture, the O3-NO2 sequence yields nitric acid. There is a need for informal contact of scientists with legislatures on an informal basis.

36487 **APTIC NO. 58678**

National Academy of Sciences-National Academy of Engineering - National Research Council, Washington, D. C., Ad Hoc Committee on Materials Policy

ELEMENTS OF A NATIONAL MATERIALS POLICY (FINAL REPORT). *Rept. NMAB-294, 81p., Aug. 1972.*

NTIS: PB-213 780

Seven major-issue areas central to the formulation of a coherent and endurable national materials policy are considered: abundances of mineral commodities and problems affecting future primary supplies; implications of environmental protection policy for national materials policy; recycling, substitution, synthesis, and design; extractive metallurgy and mineral processing; governmental incentives and controls; international implications of materials policy issues; and manpower facilities. Demographic, economic, environmental, educational, and international issues and variables are considered as appropriate to the content of all chapters even though these were in part the major charges of individual panels. Crucial to all seven issues is an eighth which is not the subject of separate study--the continuing growth of populations and demands for materials. Any viable materials policy must recognize and cope with the pressures created by the increasing per capita consumption of materials, the increasing numbers of consumers, and the growing need for control of both. The chapter on environmental protection policy includes discussion of the following points: environmental cost accounting; damage from wastes; monitoring and analyzing contaminants from industrial emission sources, especially in relation to their topographic and atmospheric interactions; finiteness of critical components of biologic systems; environmental consequences of development of energy resources; legal incentives for environmental management; environmental reclamation; compensation for environmental degradation or loss of employment due to materials production or non-production deemed essential to the general welfare; global problems; and wilderness preservation. Increased research is needed in ecosystem dynamics and studies looking toward the recovery of ecosystems from past environmental mismanagement need support. (Author abstract modified)

36488 **APTIC NO. 58695**

North Atlantic Treaty Organization, Committee on the Challenges of Modern Society

AIR POLLUTION. GUILDELINES TO ASSESSMENT OF AIR QUALITY (REVISED). SOX, TSP, CO, HC, NOX AND OXIDANTS. N. 6. (FINAL REPORT). *207p., Oct. 1972. 33 refs.*

GPO

Guidelines for the assessment of air quality in relation to sulfur oxides, total suspended particulates, carbon monoxide, hydrocarbons, nitrogen oxides, and oxidants are presented as a result of a pilot study on air pollution. Topics covered include: source consideration, emission inventory methodology, and survey procedure for emissions inventories; selection of instrumentation, methodology, sampling considerations, data processing design, and network operation for air quality monitoring; meteorological measurements; and projections of air quality.

1971

36489 **APTIC NO. 58859**

Gilpin, Alan

CLEAN AIR LEGISLATION. *In: Air Pollution. St. Lucia, Australia, University of Queensland Press, 1971, Chapt. 4, p. 17-28.*

A brief review of the history of air pollution legislation is presented. The requirements and administration of the Clean Air Acts and the Alkali Works Regulation Act of the United Kingdom are presented. The legislation passed in the United States is exemplified by Los Angeles's system, the Clean Air Acts of 1963 and 1965, and the Federal Air Quality Act of 1967. The situations in New Zealand and Canada are briefly discussed. The clean air legislation of Australia is a patchwork of that of the six different states, the shortcomings of which are pointed out. The recommendations of the Australian Senate Select Committee on Air Pollution are briefly outlined, followed by some comments by the author.

36490 **APTIC NO. 58636**

Linzon, S. N.

THE PLANT PATHOLOGIST IN AIR MANAGEMENT. Preprint, Canadian Phytopathological Society, 10p., 1971. (Presented at the Canadian Phytopathological Society, Annual Meeting, Edmonton, Alberta, June 20-24, 1971.)

The role of the plant pathologist in the Air Management Branch of the Ontario, Canada, Dept. of Energy and Resources Management is discussed. The pathologists provide liaison with agricultural and forestry interests and specialist advice for the engineering staff. They determine the degree and extent of air pollution injury on all types of vegetation throughout Ontario by investigating complaints, conducting surveillance studies, and carrying out practical research studies in controlled environment chambers on the effects of air pollutants on vegetation. Examples of the handling of some of the more than 300 vegetation complaints are described.

36491 **APTIC NO. 59251**

Purdom, P. Walton

ENVIRONMENTAL PLANNING AND MANAGEMENT. *In: Environmental Health, P. Walton Purdom (ed.), New York, Academic, 1971, Chapt. 12, p. 545-573. 44 refs.*

An overall perspective is developed for the planning and management of the environment. Elements of program planning include: determination of needs; establishment of priorities; formulation of program objectives; examination of resources available and required; preparation of plan of action, including organization; preparation of budget; and formulation of a system for evaluation. An understanding of some fundamental principles of statistics is necessary to planning and management. Factors of particular interest include: vital statistics, statistical significance, and standard population. The organization of public efforts for environmental control is discussed and includes: data gathering, evaluation, and appraisal; advisory; direct; regulatory; educational; and research.

36492 **APTIC NO. 58622**

Stelfox, David

THE ROLE OF PLANT PATHOLOGISTS IN POLLUTION ABATEMENT. *Preprint, Canadian Phytopathological Society, 4p., 1971. (Presented at the Canadian Phytopathological Society, Annual Meeting, Edmonton, Alberta, June 21, 1971.)*

The diagnosis and assessment of plant damage due to air pollution is generally discussed. Damage assessment may be satisfactorily achieved by various governmental agencies, however, the responsibility for professional diagnosis should rest with plant pathologists. Several plant damage episodes are described including those due to chlorine gas, sulfur plant stack gases, and agricultural damage.

36493 **APTIC NO. 59045**

New Hampshire Univ., Durham, Center for Industrial and Institutional Development

INTRODUCTION. *In: Air Pollut. Sampling Monit. Workshop, Durham, N. H., 1971, p. 3-4. (April 27.)*

The methods described in this manual are concerned primarily with the measurements of emissions from stationary sources. In general, these methods also can be used for testing vehicles or other moving sources. The following requirements are basic to any source test. The gas stream being sampled from a source should represent either the total or a known portion of the emissions from the source. Samples of the emissions collected for analysis must be representative of the gas stream being sampled. The volume of gas sample withdrawn for analysis must be measured in order to calculate the concentration of the analyzed constituents in the sampled gas stream. The gas flow rate from the source must be determined in order to calculate emission rates for the various constituents. The performance of a source test, from initial planning to final report, can be divided into the following steps; background of source test, inspection of source for physical test requirements, selection of test procedures, test scheduling, gas flow rate measurement, collection of samples, processing and analysis of samples, calculations from field and laboratory data, and test report.

36494 **APTIC NO. 59492**

New Hampshire Univ., Durham, Center for Industrial and Institutional Development

PLANNING A SOURCE TEST. *In: Air Pollut. Sampling Monit. Workshop, Durham, N. H., 1971, p. 7-9. (April 27.)*

When the sources or equipment have not previously been tested, a preliminary visit to the test site by source test personnel can save much time and effort. The best locations for gas flow measurements and sampling should be selected. Also to be considered during the plant inspection are accessibility, space requirements, availability of electricity, the operating schedule of the plant equipment, and estimates or preliminary measurements of temperatures, pressures, velocities, and moisture content of the gas streams to be tested. The test must be conducted under conditions representative of the desired operating characteristics of the equipment. Accurate results will depend upon selecting the correct sampling, analytical, and flow rate measurement techniques. When scheduling the actual test, the date selected must allow time following the plant inspection for provision of test facilities, for provision of personnel and equipment needed for tests of greater scope or complexity, or for development of special test methods. The date also must be coordinated with plant management personnel to ensure operation of the facilities under the conditions specified for the test.

1970

36495 **APTIC NO. 58882**

Licht, Charles

THE ENGINEERING CONSULTANT AND HIS ROLE WITH THE VENDOR. *National Assoc. of Secondary Material Industries, Inc., New York, Air Pollut. Control Technol., Proc. Workshop, Chicago, Ill., 1970, p. 120-121, 125-127. (Oct. 22.)*

One of the major problems that the buyer of control equipment faces is trying to define his specific problems so that the vendor knows that is really needed. The vendor can be asked for suggestions, or the need can be defined by the buyer if his staff has the capability. Alternatively, a consulting engineer who has knowledge in the specific area can be called in. By defining the parameters of the problem and establishing will be required of the control system, some specifications for which the manufacturers of equipment can make proper proposals are achieved.

36496 **APTIC NO. 58765**

Ryder, Robert R.

NEW YORK CITY AUTOMATED AIR-QUALITY DATA COLLECTION NETWORK. *IEEE (Inst. Elec. Electron. Engrs.) Trans. Geosci. Electron., 8(2):81-88, April 1970.*

The initial system for monitoring, telemetering, and assembling air quality data in New York City is described. The system is composed of 10 diverse monitoring locations, each containing instrumentation for the measurement of carbon monoxide, sulfur dioxide, particulates, temperature, wind speed, and wind direction. The central or control point of the network is at Air Pollution Control Dept. offices in downtown Manhattan. Display equipment, output devices, controls for the network, and the automatic equipment, including a small scale integral computer, form the network master station. The system, as now installed, can accommodate up to 30 remote telemetry stations with up to 12 instruments at each location. Plans for extension of the system are now under consideration and include mobile field laboratories using radio telemetry and additional fixed locations. (Author abstract modified)

36497 **APTIC NO. 58883**

Teller, Aaron

THE ENGINEERING CONSULTANT AND HIS ROLE WITH THE CLIENT. *National Assoc. of Secondary Material Industries, Inc., New York, Air Pollut. Control Technol., Proc. Workshop, Chicago, Ill., 1970, p. 117-119, 125-127. (Oct. 22.)*

Installing pollution controls as a response to immediate pressures is wasteful and expensive in the long run. Umbrella systems are needed which aim toward an ultimate goal of zero emissions, which is becoming a national objective. Efficiency, cost, and power consumption are not necessarily directly proportional. Total systems that will handle the variations in industrial operations, that can be run by existing personnel, and whose performance exceeds existing requirements and has low operating costs are required.

36498 **APTIC NO. 58619**

World Meteorological Organization, Geneva (Switzerland)

A BRIEF SURVEY OF THE ACTIVITIES OF THE WORLD METEOROLOGICAL ORGANIZATION RELATING TO HUMAN ENVIRONMENT. *25p., June 1970. 10 refs.*

World Meteorological Organization research programs regarding atmospheric monitoring, atmospheric pollution, urban climatology, weather and climate modification, and ocean pollution are reviewed. The global surface sypnotic stations, monitoring system, and telecommunication system are described. Relevant WMO documents and publications are listed.

36499 **APTIC NO. 59059**

Organisation for Economic Co-operation, Paris (France), Environmental Directorate

GOVERNMENTAL RESPONSIBILITIES FOR THE APPLICATION AND CONTROL OF TECHNOLOGY IN RELATION TO MAN S ENVIRONMENT. *Preprint, 37p., July 6, 1970.*

Governmental responsibilities in relation to man s environment are discussed. The general policy implications arising from studies in the public domain, notably on the eutrophication of lakes and rivers, the problem of sulfur in the atmosphere, the unintentional occurrence of pesticides, urban traffic noise, and the sonic boom are described. Possible conflicts which may arise between desired and necessary technological innovation and development, and the undesired effects on the environment are discussed. Policy makers should have a role in assessing new technology before and after it is introduced into use. Technology s role in affecting the environment and causing social and economic problems, control of technology to prevent environmental damage, the application of technology for environmental improvement, the role of international cooperation, and instruments of international cooperation are also discussed.

1965

36500 **APTIC NO. 59501**

World Health Organization, Geneva (Switzerland), Expert Committee

ENVIRONMENTAL HEALTH ASPECTS OF METROPOLITAN PLANNING AND DEVELOPMENT. REPORT OF A WHO EXPERT COMMITTEE. *World Health Organization Tech. Rept. Ser., No. 297, 68p., 1965. 32 refs.*

Environmental health aspects of metropolitan planning and development are considered. Planning measures specifically related to air pollution and its control include: the siting of new towns only after a thorough study of local topography and meteorology; location of new industries using materials or processes likely to produce air contaminants in such a way as to minimize the effects of air pollution; restriction of the use of pollution-producing fuels in satellite (dormitory) towns; provision for green belts and open spaces to facilitate the dilution and dispersion of unavoidable pollution; greater utilization of hydro-electric and atomic power and of natural gas for industrial and domestic purposes; greater utilization of central plants for the provision of both heat and hot water for entire districts; and emphasis on traffic planning to reduce the level of pollution in residential areas.

SOCIAL ASPECTS

1973

36501 **APTIC NO. 59221**

Brunner, James A., Philip Gravengaard, and Gary Bennett

TOLEDO BUSINESS REPORT. POLLUTION IN THE LOCAL COMMUNITY: CITIZEN ATTITUDES AND WILLINGNESS TO MAKE PERSONAL SACRIFICES IN ABATEMENT. *Toledo Univ., Ohio, Business Research Center, Occasional Paper No. 23, 50p., Dec. 1973. 55 refs.*

A report based on a telephone-mail survey is presented on the attitudes of residents in the Toledo, Ohio area on pollution. A systematic probability sampling technique was employed to obtain a representative sample. Air and water pollution ranked second as the most serious problem in the area, exceeded only by that of drug usage. Sixty-one percent of the citizenry indicated that they would be willing to switch to nonleaded gasoline, but only 24% reported purchasing this type of fuel in the month prior to the survey. Forty percent indicated that they would be willing to use public transportation to and from work, but only 23% had ever used such transportation in the area. The majority of the respondents were willing to spend less than $200.00 for pollution control automotive devices, even though it is estimated that by 1976 the cost may be $873.00. Approximately 48% of those responding believed that zero population growth was the key to allevating the pollution problem. There was a willingness among 40% of the citizens to purchase a small automobile to alleviate the pollution problem, and 70% were willing to pay up to a 5% increase in their monthly electric bill for pollution reduction.

1972

36502 **APTIC NO. 58862**

Doctor, R. D.

THE GROWING DEMAND FOR ENERGY. *Preprint, Rand Corp., Santa Monica, Calif., 28p., Jan. 1972.*
NTIS: AD-742 382

The patterns of current consumption of energy, especially electricity are analyzed at the national level. Methods of forecasting future electricity consumption are presented, including correlation and extrapolation techniques. Two models are given as examples. One involves building a deterministic model for Calif. based on correlation methods. The model will estimate domestic consumption by multiplying consumption per household times the number of households. Each of these factors, in turn, is determined by several other factors such as the type of appliances in each household, income per household, rate of household formation, etc. Preliminary results are presented for up to the year 2000. The other model is based on historical energy consumption and saturation data for the home, from which are derived equations that describe changes in saturation and in energy use for each appliance as a function of time. Results are presented for predictions for 1970.

36503 **APTIC NO. 58661**

Haefele, Edwin T.

ENVIRONMENTAL QUALITY AS A PROGRAM OF SOCIAL CHOICE. *In: Environmental Quality Analysis. A. V. Kneese and B. T. Bower (eds.) Baltimore, Md., John Hopkins Press, 1972, Chapt. 8, p. 281- 332. 46 refs.*

Environmental quality is viewed as a social choice problem, and representative government is discussed as the utility mechanism that has unique capabilities for aggregating individual preferences into social choices. There is a need to redress the balance between the legislative and the executive role in environmental choices at all levels of government. There is a need to force environmental issues into partisan politics at every level of government and to focus directly on institutional design. The Federal role would emphasize on the legislative side the question of appropriating and distributing funds on a regional basis. On the executive level, the Federal role would emphasize the availability of technical expertise. The states, regions, and localities would make environmental choices and decide how to allocate Federally disbursed monies, what additional monies were needed, and how best to implement these decisions. (Author conclusions modified)

1970

36504 **APTIC NO. 59483**

Wood, F. G.

PRINCIPLES OF EVOLUTION AND THE ECOLOGICAL CRISIS. *Naval Undersea Center Symp. Environ. Preserv., Proc., San Diego, Calif., 1970, 16p. 18 refs. (May 20-21, Paper 215.)*

NTIS, DDC: AD 724709

Socio-economic and technical evolutionary concepts are examined in relationship to preserving the world s environment. A look at evolutionary concepts as they apply to all highly developed technological entities demonstrates that any abrupt change in form or function tends to be disruptive and disadvantageous, that lack of adaptability and increased vulnerability to change come with increased specialization, and that development often continues along particular lines to an extreme and disadvantageous degree. The automobile is cited as an example of a technical evolution that has become restricted to a narrower ecological niche and has resulted in adverse environmental effects such as carbon monoxide build-up which may alter the climate. Socio-economic factors rather than technological inadequacies are seeen as constituting the major hindrance to necessary change since human organizations, unlike human beings, are not highly adaptable. (Author abstract modified)

GENERAL

1973

36505 **APTIC NO. 59087**

Gil, Gonzalo Piedrola

HUMAN ECOLOGY AND HEALTH. *(Ecologia humana y salud). Text in Spanish. Medicamenta, 61(508):89-96, Feb. 15, 1973.*

General problems, possibilities, and tasks to be achieved in human ecology for the protection of the human health and of the natural environment are discussed. Definitions are given of such ecological terms as pathogenic complexes, population, ecosystem, biocenosis, pathobiocenosis, corography, geofactor, anthropofactor, and environmental protection. Chemical, physical, and psychosocial types of technological contaminations are described. Protection of the natural resources in air, water, and soil, preservation and intensification of the natural neutralizing and detoxifying capacity of the environment, protection of the water of oceans, the elaboration of effective measures of envirommental protection and air quality requirements, as well as extensive mass education and professional education in environmental protection areas are among the fundamental principles of an effective protection for the future.

36506 **APTIC NO. 59295**

Gilbert, T.

SECTION 1: GROUND LEVEL CONCENTRATIONS AROUND A PUNCTIFORM EMISSION SOURCE. SEMI-PRACTICAL STACK HEIGHT CALCULATIONS FOR A SINGLE SOURCE (VDI 2289 GUIDELINE, SHEET 1, SEPTEMBER 1973 DRAFT) *(Vortragsgruppe 1: Immissionskonzentration in der Umgebung einer Punktquelle Leitung: Praxismahe Schornsteinhoehenberechnumg fuer eine Einzelquelle (Richtlinie VDI 2289 - Blatt 1 (Entwurf September 1973))). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 200:7-12, 1973. 19 refs.*

New considerations which alter the former position on chimneys as set forth in the VDI guideline 2289, section 1 Dispersion of Pollutants in the Atmosphere, Relationships between Emission and Ambient Conditions, Chimney Heights in Flat, Unbuilt Areas are presented. The considerations include: calculation of effective source height according to Briggs; arrangement of the atmospheric conditions for dispersion in six classes; the use of statistical methods to describe regional differences in dispersion conditions within the B.R.D.; and a uniform level of air pollutants throughout the B.R.D. by means of equalized, newly planned emission sources. The newest recommendations of the VDI guideline 2289, section 1, Practical Applications of Dispersion Calculations are described.

36507 **APTIC NO. 58791**

Hishida, Kazuo, Hisai Nihei, Tsunehiro Yajima, Tatsukichi Ishiguro, Yoshiteru Iwasaki, and Hiroshi Fukushima

STUDIES ON DEODORIZATION. *(Akushu boshi shisetsu shido hyojun). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):377, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 117.)*

The general policies for odor control legislature, measurement methods, emission standards, control facilities, and future plans are briefly discussed. The basic measurement method should be the three-point comparative odor bag method, rather than odor sensitivity method, which is poor in repeatability and reliability. Control facilities should include one or more methods among: wet scrubbing, combustion, catalytic oxidation, chemical oxidation, adsorption, reagent additives, enclosure, ventilation, or dilution, or other methods with equivalent performance.

36508 **APTIC NO. 58601**

Okita, Toshikazu

PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu ni tsuite). Text in Japanese. Kagaku to Kogyo (Tokyo) (Chem. Chem. Ind.), 26(9): 539-541, 1973.*

Oxidants are dangerous elements in photochemical smogs causing or acclerating asthmatic attacks, chronic bronchitis and emphysema, and the environmental standard of ozone is set at the strict level of 0.06 ppm. Nitrogen dioxide is set at the stringent rate of 0.02 ppm for the 24-hour average concentration because of its role in photochemical reactions and its effect on the human health. But in designating pollutants, various researchers have enumerated a number of pollutants which have never been known to cause any effects. Before determining these as harmful pollutants, follow-up investigations of such pollutants and actual degree of pollutant and damages should be conducted. For instance, the phenomenon known as fumigation requires much more investigation. It is a short-time phenomenon caused by the lower atmospheric movement from stability to instability, and pollutants stagnating at the upper limit of the stable layer suddenly descend. An investigation of this phenomenon requires continuous instant measurment of concentration, and adequate equipment does not exist. Oxidant meters are capable of measuring instantaneous concentration to a certain extent, but its capacity is limited to about 0.05 ppm. The vertical distribution of various elements have been measured at the time of photochemical pollution, but outside of ozone, there has been no proof that high concentrations of pollutants exist in the upper layer.

36509 **APTIC NO. 59023**

Oppeneau, J.-C.

STUDIES AND RESEARCH BEING CONDUCTED ON SULFUR DIOXIDE IN FRANCE. *(Etudes et recherches francaises sur le dioxyde de soufre). Text in French. Ann. Mines (Paris), 1973:39-46, Nov.-Dec. 1973.*

Recent studies being conducted in France concerning the effects, transformation, transfer and measurement of sulfur dioxide are surveyed. The effects of SO2, nitrogen oxides, and dusts on the human health are being studied in a complex epidemiological survey covering subjects in the respective age groups of 25-59 and 6-10 yr in Bordeaux, Fos-sur-Mer, Lille, Lyon, Mantes-la-Jolie, Marseille, Rouen, and Toulouse. Studies on the effects of SO2 on plants are concerned with the effects of SO2 on flowers and crops, as well as with the selection of SO2-resistant species. Flame photometric, spectrometric, and laser techniques for the determination and remote detection of SO2 are being developed. The mechanism of the conversion of SO2 to sulfur trioxide and to sulfuric acid, as well as the long-distance transfer of SO2 emissions are studied, the latter by systematic SO2 monitoring in several European countries, and by simulation in hydraulic models.

36510 **APTIC NO. 58430**

Yamate, Noboru

AIR POLLUTION. *(Taiki osen). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 1973:190R-195R, 1973. 190 refs.*

This is a bibliographical review on air pollution data including essays, lectures, proceedings, books, reviews, reports, and legislation under the headings of: air pollution studies in general, emission sources, organic particulates, inorganic particulates, inorganic gases, organic gases (components and analytical methods), photochemical smog, bad odor, sampling and analytical methods, and types of automatic continuous monitoring apparatuses.

36511 **APTIC NO. 58851**

Musashino Municipal Government (Japan), Dept. of Pollution and Traffic

ENVIRONMENTAL POLLUTION IN MUSASHINO CITY (1972). *(Musashino-shi no kogai). Text in Japanese. 211p., Sept. 1973.*

The administrative guidelines and activities of Musashino Municipal Government, control plans, budget, equipment, council meetings, guidance activities, pollution conditions, automobile pollution, plant damages, and water pollution are discussed. In winter, the sulfur oxide concentration level rises drastically due to heating boilers and the inversion layer that appears frequently in lower altitudes in the area. Recent studies of suspended particulates by lidar 100 m to 2 km above the ground have clarified the microstructure of the atmosphere, in which suspended particulates are pressed down by the inversion layer. Health damages during a smog warning were reported in Tokyo for 69 days in 1972, and 20 days in Musashino, compared to 44 days in Tokyo and 11 days in Musashino in 1971. However, the number of victims was much lower in 1972 compared to 1969. High oxidant concentrations (15-19) pphm) appeared during 3.3% of the total year 1972. Nitric oxide concentrations show definite seasonal patterns with high concentrations appearing from fall to winter due to inversion layers. The nitrogen dioxide concentration average for the year is low and there is no seasonal pattern. From April to October, NO2 concentration is somewhat higher because the solar energy is stronger during this period and NO is easily converted to NO2. There is a daily pattern of NO peaks about 9 am and 6 pm until late at night. This follows the traffic concentration patterns, and high NO concentrations occur close to artery roads with heavy traffic. There are no geographical differences for NO2 concentrations. High concentrations of carbon monoxide (more than 10 ppm) appeared for 3% of the entire year of 1972. The concentrations in winter are relatively high, peaks appearing in morning and evening. The meteorological conditions play an important role in winter, and high CO concentrations appear when there are atmospherically stable conditions close to the ground.

36512 **APTIC NO. 59495**

CAUSES OF THE ENDANGERMENT OF HUMANS AND OF THE ENVIRONMENT. *(Die Ursachen der Gefaehrdung von Mensch und Umwelt). Text in German. Bull. Eidgenoess. Gesundheitsamtes Beilag B, no. 6:310-311, Dec. 1973.*

General causes and possible ways of abating environmental pollution are outlined. Increased in the population, industrial production, technological efficiency, the nearly unlimited use of irreplaceable natural resources, and the increased demand for high living standards have been the factors chiefly responsible for the deterioration of the environment. Population control and limitation of the production of goods and energy will be necessary if environmental pollution is to be abated. Production should be rationed rather than expanded to preserve natural resources and prevent increased environmental deterioration.

1972

36513 **APTIC NO. 59208**

Watson, G. M.

ENVIRONMENTAL HAZARDS OF FOSSIL AND NUCLEAR POWER PRODUCTION. *Preprint, Australia Atomic Energy Commission, Lucas Heights, 25p., 1972. 8 refs. (Presented at the Australian Atomic Energy Commission Symposium on the Role of Nuclear Energy in Australia s Development, Canberra, Australia, June 1-2, 1972.)*

NTIS: AAEC-TM-627

The environmental hazards of fossil and nuclear power production are discussed and the need for engineers to recognize the hazards associated with their constructions and to make proper allowance for them when costing different solutions to a problem is stressed. The hazards can be traced from mines through processing plants to power station wastes. It is necessary that engineers develop an appropriate basis of comparison if they are to assess the relative environmental costs of nuclear and fossil fueled power stations. This must allow for effects on health, ecological effects, and aesthetic effects. There are also uncertainties for nonradioactive pollutants, and it is probably illogical to treat the dose-effect relationships of radioactive and chemical pollutants as being different in nature, as is commonly done at present. There are insufficient data available on the effects on health of various pollutants, and there is too little public agreement on the relative worth of mined and unmined natural resources to allow a detailed comparison to be made. (Author abstract modified)

1971

36514 **APTIC NO. 58860**

Gilpin, Alan

CHIMNEY HEIGHTS. *In: Air Pollution. St. Lucia, Australia, University of Queensland Press, 1971, Chapt. 6, p. 50-54. 10 refs.*

Chimney heights must be great enough that emissions are not brought down to the ground by normal down-draft. This depends on the size of nearby buildings and terrain. Wind tunnel tests on models may be necessary. A formula is given that allows for interfering nearby tall buildings. Down-wash may also bring stack gases to ground level. The risks of this may be minimized by round chimneys with as small diameter as possible and by high velocity of discharge of gases from the mouth. Formulas used for the determination of chimney heights are considered, with special attention to those predicting plume rise and the effects of thermal buoyancy.

36515 **APTIC NO. 59267**

Gilpin, Alan

AIR POLLUTION: CAUSES AND EFFECTS. *In: Air Pollution. St. Lucia, Australia, University of Queensland Press, 1971, Chapt. 2, p. 3-12. 5 refs.*

Sources of air pollution may be either natural or man-made. They may either be primary emissions from industrial, domestic, or automotive sources, or they may be formed in the atmosphere by interactions (photochemical or other wise) among primary contaminants or between contaminants and normal atmospheric constituents. The causes and effects of photochemical smog are presented, with the case of Los Angeles smog as an example. The ability of the atmosphere to naturally ventilate itself is explained, and, as is pointed out for Brisbane, Australia, natural geographic variations can cause the failure of these mechanisms to adequately disperse pollutants. A discussion of the long-term effects of air pollution on health points out the difficulty of establishing the precise role of pollutants in causing or contributing to ill-health. Bronchitis, lung cancer, and Tokyo-Yokohama asthma, and the effects of tetraethyl lead are considered. Other degradative effects of air pollution discussed are corrosion, effects on stonework, livestock, crops, and climate.

36516 **APTIC NO. 58640**

Koenig, Herman E., William E. Cooper, and James M. Falvey

ENGINEERING FOR ECOLOGICAL, SOCIOLOGICAL, AND ECONOMIC COMPATABILITY. *IEEE Inst. Elec. Electron. Engrs.) Trans. Syst., Man, Cybern., SMC-2(3):319-331, July 1972. 6 refs.*

The thesis is put forth that man, as a dominating species on the surface of the earth, must learn to engineer the developments of industry, agriculture, and human habitats, giving explicit consideration to the effects of these developments on the environment. Solutions to many of the contemporary environmental and social problems can be found in the rational design of the physical and technological features of the life-support system as a closed industrialized ecosystem. A comprehensive solution to the environmental problems of the industrialized nations appears to require the development and implementation of scientific, technical, and management capability in at least the following four major areas: the capability to assess the mass-energy rate capacities of environmental components; the capability to manipulate the ecological communities of restricted portions of the natural environment to increase the mass-energy assimilation capacity; the capability to structure the technological and spatial features of the industrial, agricultural, and urban sectors so as to retain ecological compatibility with the environment; and the capability to design and implement comprehensive social instruments of control.

SUBJECT INDEX

A

ABATEMENT
35462, 35484, 35635, 35645, 35738, 36405, 36407, 36455, 36457, 36461, 36464, 36480, 36484, 36485, 36492, 36505

ABSORPTION
35525, 35576, 35578, 35587, 35597, 35600, 35601, 35614, 35644, 35646, 35657, 35675, 35679, 35699, 35713, 35716, 35718, 35753, 35774, 35789, 35839, 35929, 35935, 35945, 36186, 36199, 36278, 36339

ABSORPTION (GENERAL)
35563, 35568, 35580, 35620, 35636, 35639, 35643, 35644, 35715, 35742, 35744, 35747, 35750, 35759, 35790, 35791, 35792, 35793, 35794, 36186

ACETALDEHYDE
35859, 35927

ACETIC ACID
36386

ACETONE
36229

ACETYLENES
35719, 35927, 35952, 36130, 36180

ACID SMUTS
35574, 35585

ACROLEIN
35851, 35856, 35877

ACUTE
36298, 36311, 36330, 36379, 36421

ADAPTATION
36248

ADSORPTION
35458, 35485, 35506, 35572, 35575, 35583, 35590, 35608, 35627, 35657, 35660, 35671, 35679, 35716, 35789, 35812, 35818, 35885, 36147, 36175, 36177, 36188, 36194, 36200, 36201, 36479

ADSORPTION (GENERAL)
35572, 35643, 35653, 35660

ADVISORY SERVICES
35500, 35531, 36431, 36439, 36462, 36474, 36479, 36486, 36495

AERODYNAMICS
36182

AEROSOL GENERATORS
35872, 36126, 36128, 36205

AEROSOLS
35460, 35514, 35601, 35630, 35662, 35677, 35799, 35801, 35803, 35810, 35814, 35826, 35833, 35839, 35852, 35867, 35869, 35878, 35883, 35903, 35905, 35913, 35924, 35931, 35953, 35992, 35995, 36002, 36027, 36029, 36034, 36039, 36047, 36050, 36051, 36052, 36057, 36067, 36078, 36087, 36088, 36091, 36109, 36112, 36114, 36115, 36116, 36125, 36126, 36128, 36129, 36134, 36182, 36202, 36204, 36205, 36209, 36218, 36221, 36226, 36274, 36326, 36329, 36336, 36394

AFTERBURNERS
35524, 35529, 35547, 35567, 35569, 35599, 35604, 35614, 35625, 35628, 35642, 35664, 35673, 35696, 35700, 35701, 35716, 35725, 35729, 35731, 35734, 35751, 35762, 35763, 35769, 35770, 35776, 35835, 36235

AIR CONDITIONING EQUIPMENT
35518, 35595, 35629

AIR POLLUTION EPISODES
35469, 35500, 36011, 36083, 36102, 36107, 36223, 36283, 36288, 36290, 36306, 36373, 36452

AIR POLLUTION FORECASTING
35527, 35528, 35975, 35997, 36024, 36043, 36045, 36049, 36060, 36062, 36074, 36082, 36083, 36089, 36094, 36098, 36100, 36104, 36106, 36107, 36110, 36154, 36179, 36488

AIR QUALITY CRITERIA
35474, 35476, 36266, 36318, 36416, 36417, 36418, 36421, 36466

AIR QUALITY MEASUREMENT PROGRAMS
35474, 35477, 35478, 35482, 35497, 35499, 35500, 35510, 35527, 35528, 35531, 35532, 35534, 35546, 35550, 35655, 35683, 35686, 35705, 35706, 35844, 35848, 35876, 35886, 35902, 35932, 35949, 35950, 35954, 35955, 35960, 35963, 35964, 35965, 35967, 35969, 35971, 35972, 35973, 35974, 35975, 35976, 35977, 35979, 35980, 35981, 35982, 35983, 35984, 35988, 35990, 35991, 35992, 35993, 35996, 35998, 35999, 36000, 36001, 36003, 36004, 36005, 36006, 36007, 36008, 36009, 36010, 36011, 36013, 36014, 36018, 36021, 36041, 36042, 36043, 36044, 36045, 36049, 36059, 36061, 36062, 36064, 36070, 36073, 36074, 36077, 36082, 36083, 36084, 36085, 36086, 36088, 36113, 36238, 36253, 36254, 36263, 36279, 36281, 36283, 36287, 36288, 36293, 36295, 36297, 36302, 36304, 36305, 36306, 36315, 36320, 36340, 36346, 36353, 36357, 36363, 36370, 36373, 36374, 36376, 36429, 36432, 36451, 36458, 36459, 36461, 36462, 36465, 36466, 36470, 36471, 36476, 36482, 36483, 36488, 36493, 36494, 36496, 36498, 36500, 36509, 36511

AIR QUALITY STANDARDS
35462, 35465, 35595, 35811, 35822, 35853, 35949, 36011, 36404, 36418, 36419, 36420, 36421, 36422, 36427, 36428, 36430, 36442, 36454, 36461, 36462, 36463, 36466, 36470, 36472, 36475, 36477, 36485, 36508

AIR RESOURCE MANAGEMENT
35531, 36107, 36404, 36430, 36432, 36440, 36442, 36443, 36453, 36470, 36474, 36480, 36484, 36487, 36490, 36491, 36499, 36503, 36507, 36511, 36512, 36516

AIR-FUEL RATIO
35552, 35553, 35556, 35588, 35591, 35625, 35626, 35632, 35650, 35665, 35666, 35680, 35722, 35740, 35743, 35746, 35748, 35749, 35751, 35765, 36146, 36169, 36172

AIRCRAFT
35456, 35464, 35466, 35480, 35489, 35517, 35526, 35529, 35533, 35534, 35680, 35734, 35736, 35752, 35754, 35765, 35780, 35843, 35865, 35875, 35961, 35962, 35970, 35987, 35989, 35994, 36000, 36005, 36019, 36025, 36053, 36067, 36068, 36090, 36402, 36414, 36422, 36499

AIRPORTS
35456, 35466, 35480, 35489, 35534, 35961, 35989, 36000, 36005

AITKEN COUNTERS
35869, 36075

ALABAMA
35550

ALASKA
35512

ALCOHOLS
35485, 35551, 35603, 35604, 35606, 35740, 35808, 35822, 35927, 35942, 36133, 36168, 36228, 36229, 36242

ALDEHYDES
35466, 35470, 35471, 35480, 35485, 35509, 35550, 35552, 35606, 35824, 35851, 35856, 35859, 35877, 35880, 35927, 35934, 35961, 35967, 35968, 35994, 36004, 36005, 36121, 36133, 36246

ALERTS
35500, 36011, 36083, 36373, 36452

ALKALINE ADDITIVES
35578, 35617, 35620, 35636, 35644, 35741, 35742, 35744, 35750, 35753, 35759, 35782, 35792, 35884

ALLERGIES
35447

ALUMINUM
35452, 35590, 35728, 35763, 35772, 35873, 36049, 36344, 36368, 36381, 36392, 36400, 36401

ALUMINUM COMPOUNDS
35466, 35590, 35642, 35728, 35803, 35954, 35973, 36227, 36262

ALUMINUM OXIDES
35642, 36177, 36402

ALVEOLI
36249, 36257, 36261, 36298, 36299, 36313, 36317, 36324

AMINES
35482, 35499, 35942, 35956, 36180, 36219

AMINO ACIDS
36247, 36248, 36249, 36300, 36327, 36383

AMMONIA
35443, 35482, 35499, 35518, 35550, 35620, 35709, 35739, 35792, 35808, 35852, 35884, 35927, 35928, 35934, 35951, 35956, 36088, 36092, 36117, 36133, 36155, 36156, 36160, 36379, 36394, 36397, 36399

AMMONIUM COMPOUNDS
35443, 35482, 35499, 35518, 35550, 35585, 35620, 35709, 35739, 35792, 35808, 35826, 35852, 35884, 35927, 35928, 35934, 35951, 35953, 35956, 36033, 36088, 36092, 36117, 36133, 36155, 36156, 36160, 36379, 36394, 36397, 36399

ANIMALS
35499, 35516, 35518, 35956, 36022, 36081, 36216, 36221, 36222, 36224, 36226, 36232, 36234, 36235, 36244, 36245, 36247, 36251, 36256, 36261, 36264, 36268, 36269, 36275, 36278, 36286, 36289, 36293, 36294, 36298, 36299, 36304, 36307, 36309, 36312, 36314, 36316, 36317, 36318, 36319, 36323, 36324, 36328, 36329, 36330, 36332, 36334, 36342, 36343, 36357, 36358, 36417, 36421, 36515

ANTHRACENES
36180, 36222

ANTHRACOSIS
36241

ANTIBODIES
36329

ANTIGENS
36226, 36329

ANTIMONY COMPOUNDS
35882

AREA EMISSION ALLOCATIONS
35473

AREA SURVEYS
35474, 35477, 35478, 35482, 35497, 35499, 35500, 35510, 35531, 35532, 35546, 35550, 35655, 35683, 35686, 35705, 35848, 35876, 35886, 35902, 35949, 35950, 35954, 35955, 35960, 35963, 35964, 35965, 35967, 35969, 35971, 35972, 35973, 35974, 35975, 35976, 35977, 35979, 35980, 35981, 35982, 35983, 35984, 35988, 35990, 35991, 35992, 35993, 35996, 35998, 35999, 36000, 36001, 36003, 36004, 36005, 36006, 36008, 36009, 36010, 36011, 36013, 36014, 36018, 36021, 36041, 36042, 36043, 36044, 36045, 36049, 36059, 36061, 36062, 36064, 36070, 36073, 36074, 36077, 36082, 36083, 36084, 36085, 36086, 36088, 36113, 36253, 36254, 36263, 36279, 36281, 36283, 36287, 36288, 36293, 36295, 36297, 36302, 36304, 36305, 36306, 36320, 36340, 36353, 36357, 36363, 36370, 36373, 36374, 36376, 36458, 36462, 36465, 36466, 36470, 36471, 36511

ARIZONA
36424

AROMATIC HYDROCARBONS
35441, 35473, 35495, 35603, 35704, 35856, 35859, 35938, 35952, 35989, 35994, 36005, 36121, 36123, 36140, 36167, 36168, 36180, 36198, 36228, 36229

ARSENIC COMPOUNDS
35441, 35490, 35565, 35882, 36371

ASBESTOS
36223, 36241, 36259, 36280, 36312, 36328, 36341, 36428

ASBESTOSIS
36223, 36241, 36244, 36259, 36280, 36313, 36341

ASHES
35490, 35504, 35512, 35710, 35785, 35979

ASPHALT
35487, 35736, 36019, 36445

ASPIRATORS
35624

ASTHMA
36253, 36255, 36277, 36285, 36287, 36302, 36320, 36508, 36515

ATMOSPHERIC MOVEMENTS
35480, 35500, 35510, 35538, 35755, 35800, 35905, 35949, 35952, 35954, 35971, 35972, 35980, 35985, 36017, 36021, 36028, 36030, 36032, 36036, 36037, 36039, 36040, 36042, 36043, 36044, 36054, 36056, 36057, 36058, 36059, 36060, 36062, 36063, 36064, 36067, 36070, 36071, 36073, 36074, 36076, 36077, 36079, 36080, 36081, 36083, 36084, 36085, 36086, 36089, 36096, 36097, 36098, 36099, 36100, 36101, 36102, 36103, 36104, 36105, 36106, 36114, 36127, 36144, 36179, 36255, 36260, 36330, 36368, 36373, 36425, 36506, 36511

ATTACK RATES
36285, 36302, 36320

AUSTRALIA
35456, 35532, 35844, 35957, 35959, 36477, 36489, 36513, 36515

AUTOMATIC METHODS
35596, 35686, 35813, 35823, 35863, 35866, 35872, 35886, 35899, 35932, 35937, 35955, 36429, 36459

AUTOMOBILES
35442, 35472, 35484, 35492, 35497, 35524, 35539, 35545, 35546, 35561, 35567, 35589, 35610, 35648, 35678, 35683, 35687, 35722, 35730, 35733, 36019, 36043, 36140, 36141, 36284, 36330, 36335, 36407, 36504

AUTOMOTIVE EMISSION CONTROL
35440, 35484, 35492, 35517, 35524, 35539, 35545, 35552, 35553, 35554, 35556, 35557, 35558, 35561, 35567, 35569, 35570, 35571, 35588, 35589, 35591, 35610, 35611, 35621, 35625, 35626, 35628, 35632, 35648, 35650, 35651, 35665, 35666, 35670, 35678, 35680, 35682, 35687, 35690, 35694, 35696, 35700, 35701, 35702, 35703, 35707, 35722, 35723, 35729, 35730, 35731, 35733, 35740, 35743, 35746, 35748, 35749, 35751, 35752, 35754, 35760, 35765, 35768, 35771, 35776, 35780, 35835, 36133, 36146, 36169, 36172, 36198, 36330, 36413, 36437, 36467, 36468

AUTOMOTIVE EMISSIONS
35440, 35454, 35456, 35457, 35464, 35465, 35466, 35472, 35480, 35484, 35486, 35489, 35491, 35492, 35495, 35497, 35503, 35508, 35509, 35510, 35511, 35517, 35519, 35524, 35527, 35528, 35529, 35531, 35532, 35534, 35539, 35546, 35552, 35556, 35567, 35569, 35570, 35588, 35589, 35591, 35609, 35610, 35611, 35621, 35625, 35626, 35628, 35632, 35642, 35647, 35648, 35650, 35651, 35665, 35666, 35673, 35678, 35679, 35680, 35682, 35683, 35687, 35690, 35694, 35700, 35701, 35703, 35718, 35722, 35723, 35727, 35729, 35730, 35731, 35734, 35740, 35741, 35743, 35746, 35748, 35749, 35751, 35752, 35754, 35760, 35771, 35780, 35816, 35835, 35843, 35865, 35866, 35875, 35893, 35907, 35952, 35957, 35961, 35962, 35967, 35968, 35970, 35972, 35974, 35978, 35987, 35989, 35991, 35993, 35994, 36000, 36001, 36005, 36006, 36009, 36010, 36011, 36012, 36025, 36043, 36104, 36110, 36146, 36167, 36176, 36190, 36198, 36223, 36235, 36268, 36284, 36325, 36330, 36357, 36371, 36377, 36402, 36416, 36433, 36435, 36441, 36457, 36467, 36486, 36499, 36500, 36511, 36515

AUTOPSY
36241, 36276, 36303

AZOLES
36372

B

BACTERIA
35941, 35969, 36221, 36226, 36297, 36314, 36319, 36334

BAFFLES
35664

BAG FILTERS
35487, 35596, 35629, 35655, 35769, 35782

BALLOONS
35913, 36041

BANDING
36355

BARIUM COMPOUNDS
35468, 35694, 35839, 35886, 36227

BASIC OXYGEN FURNACES
35633, 35655, 35667

BELGIUM
35491, 35857, 35993, 36095, 36334, 36429, 36477

BENZENE-SOLUBLE ORGANIC MATTER
35701

BENZENES
35994, 36228, 36229

BENZO(3-4)PYRENE
35702, 35983, 36016, 36018, 36222, 36256, 36282

BENZOPYRENES
35702, 35983, 35989, 36016, 36018, 36167, 36222, 36256, 36282, 36294

BERYLLIUM COMPOUNDS
35490, 35879, 36008

BESSEMER CONVERTERS
35655

BIO-ASSAY
36323

BIOCLIMATOLOGY
36255, 36260, 36274, 36320, 36394, 36395, 36399, 36401

BIRDS
35499, 36293

BIRMINGHAM,ALABAMA
35550

BLACK LIQUOR OXIDATION
35605, 35622, 35788, 36405

BLAST FURNACES
35598

BLOOD CELLS
36220, 36226, 36231, 36233, 36244, 36262, 36272, 36301

BLOOD CHEMISTRY
35492, 36010, 36231, 36238, 36243, 36247, 36248, 36250, 36268, 36311, 36339

BODY FLUIDS
36338

BOILERS
35459, 35470, 35496, 35515, 35574, 35580, 35584, 35619, 35738, 35742, 35764, 35775, 35782, 35937, 36416, 36452, 36479, 36511

BONES
36226

BREATHING
36230, 36255, 36291

BRICKS
35502

BROMINE COMPOUNDS
35803, 36017

BRONCHI
36257, 36324

BRONCHIAL CANCER
36324

BRONCHITIS
36223, 36253, 36255, 36273, 36277, 36287, 36508, 36515

BRONCHODILATORS
36298

BROWNIAN MOVEMENT
35630, 36163, 36336

BUBBLE TOWERS
35679

BUDGETS
36409, 36413, [illegible], 36503, 36511

BUILDINGS
35533, 35595, 35948, 35985, 36020, 36144, 36448

BUSES
35472, 35546, 35694

BUTADIENES
35473, 35859

BUTANES
35927, 36168

BY-PRODUCT RECOVERY
35444, 35507, 35513, 35540, 35543, 35572, 35573, 35576, 35578, 35585, 35599, 35602, 35604, 35618, 35641, 35643, 35657, 35672, 35684, 35685, 35714, 35715, 35735, 35750, 35770, 35772, 35774, 35775, 35777, 35789, 35791, 35792, 35793, 36405

C

CADMIUM
36388

CADMIUM COMPOUNDS
35455, 35501, 35533, 35537, 35854, 35874, 35882, 35958, 35963, 35973, 35979, 35988, 35990, 35996, 36000, 36001, 36008, 36009, 36223, 36227, 36278, 36279, 36301, 36349, 36352, 36353, 36359, [illegible], 36375

CALCIUM COMPOUNDS
35584, 35663, 35803, 36113, 36115, 36354

CALIBRATION METHODS
35798, 35829, 35839, 35847, 35849, 35865, 35867, 35872, 35874, 35883, 35888, 35889, 35898, 35913, 35919, 35923, 35926, 35930, 35938, 36112, 36144, 36388, 36437

CALIFORNIA
35458, 35527, 35648, 35948, 35952, 35995, 36068, 36097, 36340, 36424, 36430, 36433, 36457, 36468, 36473, 36475, 36489, 36502, 36515

CAMERAS
36376

CANADA
35449, 35462, 35503, 35516, 35562, 35572, 35584, 35616, 35617, 35622, 35671, 35684, 35685, 35788, 35929, 35937, 36006, 36022, 36032, 36038, 36054, 36113, 36125, 36139, 36143, 36216, 36342, 36367, 36489, 36490, 36492

CANCER
36219, 36222, 36239, 36241, 36303, 36312, 36313, 36324, 36328, 36330, 36331, 36515

CARBON BLACK
35458, 35506, 35575, 35597, 35617, 35627, 35651, 35653, 35660, 35681, 35684, 35685, 35725, 35819, 35826, 36188, 36201, 36226, 36261, 36329, 36401, 36479

CARBON DIOXIDE
35443, 35445, 35463, 35475, 35486, 35595, 35603, 35675, 35719, 35740, 35777, 35832, 35944, 35986, 35987, 36005, 36051, 36087, 36147, 36155, 36208, 36213, 36237, 36282

CARBON DISULFIDE
35481, 35581, 36148

CARBON MONOXIDE
35440, 35443, 35445, 35456, 35464, 35466, 35470, 35471, 35472, 35484, 35486, 35488, 35493, 35497, 35508, 35511, 35517, 35519, 35524, 35528, 35529, 35531, 35534, 35539, 35546, 35550, 35552, 35571, 35589, 35591, 35595, 35599, 35603, 35609, 35610, 35611, 35625, 35626, 35628, 35632, 35640, 35650, 35665, 35673, 35675, 35680, 35682, 35687, 35694, 35696, 35700, 35703, 35707, 35719, 35723, 35725, 35729, 35731, 35732, 35734, 35740, 35746, 35749, 35751, 35752, 35756, 35760, 35765, 35771, 35796, 35818, 35831, 35832, 35865, 35891, 35899, 35907, 35908, 35920, 35926, 35927, 35944, 35948, 35957, 35960, 35961, 35967, 35968, 35974, 35978, 35981, 35987, 35993, 36000, 36004, 36005, 36007, 36011, 36013, 36019, 36064, 36068, 36082, 36087, 36092, 36110, 36147, 36195, 36215, 36217, 36230, 36233, 36235, 36237, 36240, 36286, 36298, 36318, 36320, 36324, 36330, 36335, 36357, 36401, 36416, 36420, 36421, 36422, 36437, 36441, 36467, 36475, 36488, 36511

CARBONATES
35468, 36115, 36402

CARBONYLS
35503, 35572, 35701

CARBOXYHEMOGLOBIN
36215, 36230, 36233, 36271, 36286, 36318, 36335, 36421

CARBURETION
35570, 35588, 35625, 35650

CARBURETOR EVAPORATION LOSSES
35539

CARCINOGENS
35702, 35860, 35983, 36167, 36219, 36222, 36239, 36241, 36294, 36323

CARDIOVASCULAR DISEASES
36215, 36223, 36240, 36269, 36286, 36318

CASCADE SAMPLERS
35801, 35810, 35814, 35853, 35854, 35883, 35906, 35980

CATALYSIS
35473, 35569, 35571, 35572, 35577, 35584, 35606, 35609, 35617, 35625, 35631, 35646, 35656, 35657, 35673, 35691, 35692, 35696, 35711, 35719, 35732, 35751, 35766, 35773, 35776, 35835, 36155, 36189, 36195, 36235

CATALYSTS
35473, 35569, 35571, 35572, 35577, 35606, 35609, 35625, 35631, 35646, 35656, 35673, 35691, 35692, 35696, 35711, 35732, 35751, 35766, 35773, 35776, 35835, 36155, 36195, 36235

CATALYTIC ACTIVITY
35569, 35571, 35577, 35584, 35609, 35617, 35656, 35657, 35692, 35711, 35719, 35732, 35751, 35773, 36155, 36195

CATALYTIC AFTERBURNERS
35567, 35569, 35625, 35628, 35673, 35696, 35701, 35716, 35731, 35751, 35776, 35835, 36235

CATALYTIC OXIDATION
35485, 35584, 35605, 35606, 35609, 35622, 35627, 35646, 35716, 35725, 35732, 35766, 35788, 35845, 36155, 36405

CATS
36298

CATTLE
35499, 35956, 36081

CELL GROWTH
36269, 36275, 36282, 36293

CELL METABOLISM
36216, 36222, 36224, 36226, 36231, 36264, 36293, 36299, 36311, 36323

CELLS
36220, 36226, 36231, 36233, 36244, 36249, 36257, 36261, 36262, 36272, 36281, 36282, 36299, 36301, 36317, 36319, 36322, 36323, 36324, 36329, 36338, 36350, 36382

CEMENTS
35602, 35639, 35684, 35685, 35784, 35949, 36019, 36076

CENTRIFUGAL SEPARATORS
35468, 35498, 35590, 35593, 35598, 35614, 35624, 35629, 35637, 35655, 35674, 35705, 35737, 35777, 35785, 35787

CERAMICS
35469, 35477, 35502, 35677

CESIUM COMPOUNDS
36227

CHARCOAL
35448, 35664, 36147, [illegible]

CHEMICAL BONDS
36187, 36188, 36217

CHEMICAL COMPOSITION
35455, 35460, 35465, 35490, 35526, 35562, 35633, 35701, 35801, 35804, 35848, 35854, 35860, 35863, 35867, 35881, 35882, 35914, 35947, 35952, 35953, 35965, 35970, 35973, 35979, 35982, 35984, 35988, 35989, 35996, 36000, 36003, 36005, 36008, 36010, 36011, 36012, 36014, 36016, 36017, 36027, 36113, 36115, 36289

CHEMICAL METHODS
35479, 35804, 35821, 35823, 35826, 35827, 35834, 35839, 35849, 35859, 35866, 35877, 35880, 35888, 35892, 35899, 35901, 35909, 35910, 35915, 35921, 35928, 35937, 35939, 35957, 35990

CHEMICAL PROCESSING
35444, 35462, 35473, 35474, 35478, 35481, 35488, 35505, 35506, 35507, 35572, 35548, 35551, 35559, 35565, 35605, 35606, 35617, 35622, 35627, 35631, 35652, 35667, 35686, 35711, 35725, 35726, 35727, 35735, 35755, 35775, 35788, 35790, 35822, 35945, 35971, 36006, 36019, 36040, 36068, 36405, 36416, 36423, 36445

CHEMISTS
36486

CHIBA PREFECTURE
35976, 35990, 36346, 36360, 36381, 36400

CHICAGO
36107, 36260

CHLORIDES
35452, [illegible], 35597, 35601, 35769, 35839, 36113, [illegible], 36168, 36379, 36390, 36392, 36394, 36402

CHLORINATED HYDROCARBONS
35479, 35504, 35533, 35736, 35777, 35808, 35890, 35938, 35947, 36009, 36228, [illegible]

CHLORINE
35477, 35763, 35775, 35934, 36394

CHLORINE COMPOUNDS
35452, 35477, 35597, 35601, 35769, 35803, 35839, 35848, 35934, 35999, 36017, 36027, 36113, 36117, 36168, 36379, 36390, 36392, 36393, 36394, 36402

CHLOROPLASTS
36366, 36373, 36382

CHLOROSIS
36370, 36373, 36381

CHROMATOGRAPHY
35445, 35473, 35551, 35719, 35759, 35796, 35802, 35807, 35812, 35818, 35825, 35836, 35851, 35860, 35875, 35877, 35885, 35889, 35891, 35898, 35916, 35926, 35942, 35944, 35952, 35994, 36265, 36443, 36509

CHROMIUM
36399

CHROMIUM COMPOUNDS
35466, 35501, 35506, 35642, 35854, 35904, 35958, 35973, 35990, 36001, 36008, 36009, 36227, 36371, 36375

CHROMIUM OXIDES
36018, 36314

CILIA
36324, 36338

CINDERS
35504, 35515

CIRCULATORY SYSTEM
36215, 36230, 36286

CITY GOVERNMENTS
36462, 36474

CLAY
36303

CLEAN AIR ACT
35567, 36413, 36424, 36426, 36428, 36430, 36438, 36478, 36489

CLOUD SEEDING
36031, 36326

CLOUDS
35601, 36029, 36030, 36075, 36080, 36119, 36120

CLOVER
35954

COAL
35455, 35463, 35467, 35470, 35490, 35496, 35505, 35520, 35530, 35542, 35548, 35566, 35582, 35584, 35619, 35623, 35656, 35676, 35737, 35742, 35747, 35761, 35764, 35804, 35858, 35881, 35909, 35965, 36094, 36107, 36181, 36265, 36403

COAL CHARACTERISTICS
35490, 35505, 35542, 35582, 35623, 35804, 35858, 35881, 36181

COAL PREPARATION
35441, 35582, 35618, 35623, 35668, 35676, 35724, 35726, 36181, 36403

COAL RESOURCES
35490, 35623

COAL TARS
35441

COBALT COMPOUNDS
35904, 35988, 35990, 36008, 36371

COKE
35505, 35652, 35726

COLLECTORS
35459, 35468, 35498, 35574, 35590, 35593, 35598, 35608, 35614, 35624, 35629, 35637, 35651, 35652, 35655, 35664, 35667, 35674, 35698, 35705, 35720, 35724, 35737, 35777, 35785, 35787, 36405, 36462, 36479

COLORADO
36027, 36433

COLORIMETRY
35490, 35821, 35822, 35823, 35824, 35827, 35841, 35859, 35893, 35895, 35918, 35930, 35935, 35940, 35945, 35994, 36003

COLUMN CHROMATOGRAPHY
36265

COMBUSTION
35445, 35446, 35448, 35449, 35451, 35457, 35493, 35619, 35621, 35640, 35680, 35683, 35734, 35738, 35761, 35882, 35901, 36033, 36117, 36124, 36136, 36153, 36169, 36170, 36181, 36209

COMBUSTION AIR
35440, 35446, 35483, 35515, 35574, 35591, 35603, 35619, 35649, 35683, 35691, 35723, 35737, 35740, 35746, 35777, 35785, 36150, 36169

COMBUSTION PRODUCTS
35441, 35442, 35445, 35446, 35448, 35449, 35450, 35451, 35452, 35455, 35458, 35459, 35461, 35467, 35469, 35471, 35474, 35475, 35477, 35478, 35479, 35481, 35485, 35488, 35490, 35493, 35494, 35495, 35496, 35500, 35501, 35504, 35506, 35511, 35512, 35514, 35515, 35516, 35531, 35532, 35537, 35543, 35551, 35555, 35559, 35560, 35563, 35564, 35565, 35568, 35573, 35574, 35576, 35577, 35579, 35580, 35581, 35583, 35584, 35585, 35587, 35590, 35597, 35598, 35599, 35600, 35603, 35604, 35605, 35606, 35607, 35608, 35612, 35614, 35615, 35617, 35618, 35619, 35620, 35622, 35624, 35627, 35631, 35633, 35635, 35636, 35638, 35639, 35641, 35643, 35644, 35645, 35649, 35652, 35653, 35655, 35657, 35659, 35660, 35662, 35663, 35664, 35669, 35672, 35679, 35683, 35686, 35688, 35689, 35691, 35693, 35695, 35697, 35698, 35702, 35705, 35706, 35709, 35710, 35712, 35714, 35715, 35716, 35726, 35735, 35737, 35741, 35742, 35744, 35745, 35747, 35750, 35753, 35756, 35759, 35761, 35762, 35763, 35764, 35766, 35769, 35770, 35774, 35775, 35777, 35778, 35782, 35785, 35788, 35789, 35790, 35791, 35792, 35793, 35794, 35822, 35827, 35828, 35829, 35850, 35862, 35873, 35876, 35886, 35893, 35901, 35909, 35910, 35928, 35933, 35934, 35937, 35940, 35946, 35964, 35965, 35967, 35968, 35971, 35979, 35981, 36001, 36009, 36011, 36022, 36036, 36040, 36046, 36049, 36059, 36062, 36065, 36072, 36073, 36077, 36082, 36085, 36094, 36096, 36103, 36111, 36133, 36136, 36181, 36209, 36237, 36250, 36269, 36304, 36325, 36357, 36363, 36368, 36394, 36397, 36405, 36416, 36419, 36452, 36454, 36462, 36463, 36466, 36470, 36479, 36487, 36514, 36515

COMMERCIAL EQUIPMENT
35486

COMMERCIAL FIRMS
36434

COMPLAINTS
35522, 35531, 35532, 36006, 36102, 36270, 36443, 36466, 36479

COMPLIANCE
36298, 36419, 36424, 36433, 36436, 36438, 36444, 36446, 36447, 36450, 36473, 36478

COMPRESSION
35553, 35554

COMPUTER PROGRAMS
35553, 35554, 35556, 35557, 35558, 35563, 35721, 35734, 35913, 36024, 36055, 36056, 36181, 36185

COMPUTERS
35556, 35557, 35707, 35743, 35810, 35872, 36046, 36107, 36122, 36185, 36465, 36496

CONCRETE
36019

CONDENSATION
35516, 35566, 35576, 35612, 35637, 35699, 35718, 36033, 36117, 36118, 36119, 36120, 36205, 36208

CONDENSATION (ATMOSPHERIC)
35601, 35869, 36029, 36030, 36034, 36075, 36080, 36088, 36117, 36118, 36119, 36120

CONSTRUCTION MATERIALS
35468, 35483, 35487, 35502, 35583, 35597, 35602, 35639, 35684, 35685, 35729, 35736, 35784, 35949, 36019, 36076, 36289, 36396, 36445

CONTINUOUS MONITORING
35500, 35510, 35531, 35560, 35755, 35811, 35823, 35834, 35844, 35848, 35858, 35863, 35866, 35872, 35886, 35892, 35897, 35915, 35916, 35937, 35939, 35957, 35982, 35987, 36020, 36063, 36073, 36459

CONTROL AGENCIES
36018, 36413, 36415, 36431, 36450, 36452, 36469, 36477, 36478

CONTROL PROGRAMS
35462, 35465, 35474, 35532, 35543, 35645, 35648, 35655, 35932, 36404, 36407, 36411, 36412, 36413, 36430, 36432, 36434, 36439, 36450, 36454, 36455, 36457, 36462, 36464, 36467, 36468, 36470, 36475, 36478, 36480, 36486, 36507, 36511

CONTROLLED ATMOSPHERES
35832, 36155

CONVECTION (ATMOSPHERIC)
36021, 36058

COOLING
35607, 35611, 35612, 35669, 35690, 35903, 36029, 36190

COOLING TOWERS
36111

COPPER
35549, 35769, 35772, 36392, 36399, 36400, 36401

COPPER ALLOYS
36401

COPPER COMPOUNDS
35501, 35506, 35563, 35565, 35751, 35882, 35963, 35973, 35979, 35988, 35990, 35996, 36000, 36008, 36009, 36227, 36279, 36331, 36353, 36371, 36375

CORONA
35654

CORROSION
35642, 35667, 36388, 36389, 36390, 36391, 36392, 36393, 36394, 36397, 36398, 36399, 36400, 36401, 36402, 36420, 36515

COSTS
35452, 35461, 35498, 35507, 35535, 35545, 35547, 35561, 35573, 35578, 35579, 35580, 35582, 35597, 35617, 35619, 35633, 35634, 35647, 35648, 35667, 35691, 35692, 35727, 35728, 35733, 35741, 35742, 35761, 35762, 35764, 35771, 35773, 35776, 35778, 35779, 35782, 35793, 35813, 35890, 35926, 36403, 36405, 36406, 36408, 36409, 36410, 36411, 36412, 36423, 36427, 36430, 36460, 36480, 36484, 36487, 36497, 36513

COTTON
36382

COTTON GINNING
35538, 36245, 36445

COUGH
36305

CRANKCASE EMISSIONS
35511, 35524, 35539, 35682, 35723

CRANKCASE LUBRICATION FUMES
35682

CRANKCASE VENTILATION AIR
35511, 35682, 35723

CRITERIA
35442, 35474, 35476, 35655, 35669, 36251, 36266, 36318, 36416, 36417, 36418, 36421, 36454, 36466

CROP SPRAYING
36054

CROPS
35469, 35785, 35940, 35954, 36345, 36348, 36352, 36353, 36374, 36378, 36381, 36382, 36384, 36386

CUPOLAS
35471, 35501, 35655, 35705

CYANIDES
35441, 35884, 35962, 36005, 36033

CZECHOSLOVAKIA
35518, 35661, 35674, 35717, 35820, 35915, 36280, 36337, 36358, 36380

D

DATA ANALYSIS
35527, 35528, 35886, 36098, 36408

DATA HANDLING SYSTEMS
35527, 35528, 35553, 35554, 35556, 35557, 35558, 35563, 35721, 35734, 35743, 35759, 35886, 35913, 35926, 35932, 36007, 36024, 36055, 36056, 36073, 36098, 36107, 36181, 36185, 36408, 36429, 36451, 36458, 36459, 36465, 36476, 36488, 36496

DECOMPOSITION
35443, 35568, 36124, 36146, 36153, 36183, 36188, 36210, 36391

DENMARK
36319

DENSITY
35594, 35620, 35817, 35862, 35995, 36091, 36130, 36133, 36138, 36156, 36193, 36197, 36199

DEPOSITION
35455, 35820, 36023, 36054, 36055, 36056, 36066, 36087, 36114, 36218, 36293, 36310, 36336, 36361

DESULFURIZATION OF FUELS
35441, 35574, 35582, 35618, 35623, 35631, 35638, 35645, 35656, 35668, 35676, 35686, 35692, 35695, 35711, 35712, 35724, 35726, 35773, 36166, 36181, 36403, 36406, 36479

DETERGENT MANUFACTURING
35548, 35745

DIAGNOSIS
36241, 36276, 36303, 36323

DIESEL ENGINES
35440, 35454, 35457, 35472, 35503, 35519, 35539, 35552, 35567, 35621, 35666, 35683, 35694, 35703, 36013, 36015, 36150, 36190

DIFFUSION
35455, 35534, 35601, 35756, 35800, 35857, 35943, 36023, 36024, 36030, 36036, 36038, 36039, 36040, 36042, 36044, 36048, 36049, 36053, 36054, 36055, 36056, 36059, 36061, 36062, 36066, 36067, 36068, 36069, 36070, 36071, 36074, 36076, 36077, 36079, 36080, 36084, 36085, 36087, 36092, 36095, 36096, 36097, 36098, 36099, 36100, 36101, 36103, 36104, 36105, 36106, 36107, 36108, 36110, 36111, 36114, 36120, 36122, 36127, 36136, 36154, 36169, 36176, 36179, 36202, 36205, 36298, 36336, 36419, 36423, 36425, 36456, 36464, 36481

DIFFUSION MODELS
35534, 35857, 36023, 36024, 36036, 36038, 36040, 36042, 36044, 36049, 36053, 36055, 36061, 36062, 36066, 36068, 36071, 36074, 36076, 36080, 36085, 36087, 36095, 36096, 36100, 36101, 36103, 36104, 36106, 36107, 36108, 36110, 36114, 36122, 36127, 36154, 36179, 36202, 36419, 36423, 36425, 36464

DIGESTIVE SYSTEM
36222, 36224, 36226, 36231, 36265, 36309

DIGITAL METHODS
35759, 35853, 35887, 35913, 36451

DIOLEFINS
35473, 35859

DIPHENYLS
36180

DISCOLORATION
36390

DISPERSIONS
35943

DISPLACEMENT
35888

DISSOCIATION
35554, 35558, 35942, 36148, 36152, 36157, 36168, 36174, 36214

DISTILLATE OILS
35695

DOGS
36286, 36293

DOMESTIC HEATING
35511, 35514, 35735, 35949, 36013, 36019, 36330, 36454, 36500

DROPLETS
35515, 35560, 35601, 35608, 35615, 36118, 36119, 36120, 36126, 36128, 36145, 36162

DRUGS
36298, 36316

DRYING
35446

DUMPS
36019

DUST FALL
35467, 35755, 35957, 35979, 36003, 36010

DUSTS
35442, 35459, 35467, 35470, 35471, 35472, 35475, 35490, 35498, 35501, 35502, 35504, 35511, 35514, 35518, 35526, 35531, 35538, 35541, 35566, 35574, 35585, 35595, 35596, 35597, 35598, 35602, 35624, 35629, 35633, 35634, 35637, 35639, 35652, 35655, 35661, 35669, 35698, 35705, 35714, 35720, 35724, 35736, 35755, 35758, 35767, 35778, 35783, 35786, 35787, 35845, 35846, 35847, 35849, 35853, 35854, 35858, 35862, 35868, 35873, 35887, 35914, 35922, 35928, 35955, 35957, 35958, 35960, 35963, 35965, 35967, 35968, 35976, 35983, 35984, 35989, 35990, 35997, 36001, 36004, 36010, 36012, 36014, 36051, 36056, 36064, 36082, 36090, 36094, 36105, 36111, 36117, 36175, 36199, 36226, 36236, 36244, 36245, 36262, 36267, 36270, 36276, 36289, 36294, 36301, 36303, 36304, 36310, 36312, 36317, 36322, 36328, 36337, 36341, 36347, 36354, 36375, 36377, 36392, 36401, 36402, 36459, 36462, 36479, 36509

DYNAMOMETERS
35687, 35729, 35835, 36437

E

ECONOMIC LOSSES
36408, 36412, 36460

EDUCATION
35527, 35528, 35533, 36098, 36432

ELECTRIC FURNACES
35471, 35633, 35655, 35705, 35786

ELECTRIC POWER PRODUCTION
35450, 35455, 35459, 35461, 35467, 35470, 35474, 35498, 35513, 35514, 35520, 35521, 35530, 35535, 35536, 35542, 35548, 35561, 35573, 35619, 35638, 35658, 35683, 35686, 35709, 35735, 35737, 35738, 35742, 35747, 35755, 35756, 35761, 35764, 35775, 35782, 35793, 35900, 35909, 35971, 36019, 36046, 36068, 36072, 36094, 36107, 36111, 36330, 36357, 36403, 36419, 36423, 36453, 36484, 36485, 36500, 36502, 36513

ELECTRIC PROPULSION
35440, 35539, 35545

ELECTRICAL MEASUREMENT DEVICES
35586

ELECTRICAL PROPERTIES
35562, 35594, 35654, 35661, 35698, 35845, 35973, 35990, 36126, 36161, 36191, 36193

ELECTRICAL RESISTANCE
35562

ELECTRICITY (ATMOSPHERIC)
35845

ELECTROCHEMICAL METHODS
35804, 35821, 35823, 35827, 35834, 35849, 35866, 35892, 35899, 35901, 35910, 35915, 35928, 35990

ELECTROCONDUCTIVITY ANALYZERS
35823, 35834, 35848, 35892

ELECTROLYSIS
35706, 35770

ELECTRON MICROSCOPY
35848, 35953, 36303, 36324

ELECTROSTATIC COUNTERS
35845

ELECTROSTATIC PRECIPITATORS
35487, 35504, 35585, 35586, 35593, 35598, 35614, 35629, 35633, 35639, 35654, 35655, 35661, 35662, 35667, 35669, 35708, 35714, 35717, 35737, 35757, 35777, 35779, 35847, 35853, 36111, 36403, 36405

EMISSION INVENTORIES
35550, 36013, 36019, 36068, 36106, 36488

EMISSION STANDARDS
35450, 35458, 35478, 35532, 35539, 35548, 35567, 35569, 35625, 35678, 35776, 35811, 35835, 36414, 36416, 36423, 36428, 36436, 36437, 36441, 36445, 36446, 36447, 36452, 36462, 36470, 36477, 36507

EMISSIVITY
35680, 35973, 35990

EMPHYSEMA
36277, 36287, 36508

ENFORCEMENT PROCEDURES
35500, 36432, 36468

ENGINE DESIGN MODIFICATION
35440, 35524, 35539, 35545, 35567, 35570, 35588, 35589, 35610, 35611, 35621, 35626, 35678, 35682, 35687, 35700, 35722, 35730, 35731, 35746, 35749, 35752, 35765, 35768, 35771, 35780

ENGINE OPERATING CYCLES
35456, 35472, 35486, 35497, 35508, 35509, 35517, 35524, 35528, 35529, 35552, 35553, 35554, 35557, 35558, 35570, 35574, 35591, 35632, 35665, 35666, 35680, 35696, 35700, 35707, 35709, 35722, 35740, 35749, 35752, 35835, 35843, 35875, 35962, 35968, 35970, 35987, 35989, 35994

ENGINE OPERATION MODIFICATION
35440, 35524, 35552, 35553, 35554, 35556, 35557, 35558, 35567, 35570, 35588, 35591, 35610, 35625, 35626, 35632, 35650, 35665, 35666, 35678, 35680, 35700, 35707, 35722, 35723, 35740, 35743, 35746, 35748, 35749, 35751, 35752, 35765, 35776, 36133, 36146, 36169, 36172, 36467

ENGINEERS
36516

ENZYMES
36222, 36223, 36224, 36231, 36286, 36300, 36322, 36332, 36386

EPIDEMIOLOGY
36010, 36241, 36253, 36254, 36255, 36263, 36273, 36279, 36280, 36281, 36283, 36285, 36287, 36290, 36293, 36295, 36297, 36302, 36305, 36307, 36312, 36315, 36320, 36328, 36374, 36417, 36421, 36509

EPITHELIUM
36324

EQUIPMENT CRITERIA
35655, 35669

EQUIPMENT STANDARDS
35655, 35811, 35837, 36457

ESTERS
35480, 35885, 36228, 36229

ETHYL ALCOHOL
35808, 36133, 36228, 36229

ETHYLENE
35719, 35777, 35808, 35927, 36121, 36327

EUROPE
35440, 35452, 35453, 35457, 35458, 35459, 35467, 35468, 35476, 35491, 35492, 35493, 35496, 35505, 35507, 35511, 35515, 35518, 35521, 35536, 35541, 35551, 35552, 35565, 35571, 35588, 35592, 35603, 35604, 35606, 35613, 35618, 35621, 35624, 35625, 35626, 35633, 35634, 35635, 35638, 35643, 35644, 35645, 35659, 35661, 35669, 35674, 35677, 35678, 35686, 35687, 35695, 35697, 35699, 35702, 35706, 35707, 35709, 35712, 35714, 35717, 35720, 35721, 35726, 35735, 35737, 35745, 35746, 35757, 35758, 35761, 35764, 35766, 35767, 35774, 35775, 35783, 35786, 35787, 35792, 35794, 35795, 35799, 35801, 35807, 35809, 35814, 35815, 35816, 35820, 35822, 35851, 35857, 35858, 35880, 35891, 35895, 35899, 35900, 35903, 35906, 35910, 35911, 35915, 35916, 35917, 35918, 35921, 35925, 35928, 35935, 35939, 35941, 35951, 35953, 35955, 35978, 35993, 36012, 36013, 36015, 36016, 36018, 36020, 36034, 36037, 36040, 36044, 36046, 36049, 36051, 36052, 36065, 36075, 36076, 36078, 36079, 36080, 36081, 36088, 36091, 36093, 36094, 36095, 36096, 36100, 36101, 36102, 36103, 36105, 36108, 36109, 36111, 36112, 36114, 36115, 36116, 36123, 36129, 36145, 36146, 36148, 36159, 36163, 36164, 36165, 36173, 36176, 36177, 36180, 36183, 36191, 36192, 36195, 36196, 36200, 36201, 36202, 36203, 36204, 36205, 36209, 36212, 36214, 36222, 36223, 36224, 36231, 36232, 36233, 36238, 36239, 36241, 36242, 36243, 36244, 36245, 36246, 36248, 36251, 36252, 36255, 36256, 36257, 36259, 36261, 36266, 36274, 36280, 36282, 36292, 36303, 36308, 36309, 36310, 36311, 36312, 36313, 36315, 36318, 36319, 36322, 36325, 36327, 36328, 36334, 36337, 36339, 36341, 36344, 36347, 36348, 36349, 36358, 36359, 36380, 36395, 36404, 36405, 36406, 36408, 36409, 36410, 36411, 36412, 36417, 36418, 36420, 36425, 36427, 36429, 36440, 36453, 36454, 36455, 36456, 36458, 36459, 36461, 36465, 36476, 36477, 36481, 36482, 36489, 36498, 36499, 36505, 36506, 36509, 36512

EVAPORATORS
35605, 35788

EXCESS AIR
35440, 35515, 35591, 35603, 35649, 35691, 35737, 35740, 36150, 36169

EXCRETIONS
35956, 36228, 36318, 36339

EXHAUST SYSTEMS
35581, 35598, 35605, 35607, 35624, 35629, 35652, 35690, 35720, 35725, 35763, 35786, 35868

EXPERIMENTAL EQUIPMENT
35564, 35723, 35743, 35797, 35806, 35832, 35848, 35849, 35864, 35866, 35871, 35872, 36144, 36209, 36346

EXPERIMENTAL METHODS
35564, 35597, 35613, 35830, 35832, 35839, 35849, 35852, 35885, 35888, 35893, 35939, 36166, 36171, 36372

EXPLOSIONS
36067, 36179, 36212

EXPOSURE CHAMBERS
35824, 35832, 36355, 36360

EXPOSURE METHODS
36218, 36224, 36226, 36235, 36247, 36275, 36278, 36298, 36319, 36329, 36355, 36361, 36367

EYE IRRITATION
36102, 36132, 36242, 36288, 36296, 36305, 36340

EYES
36242

F

FALLOUT
36066

FANS (BLOWERS)
35581, 35624, 35720, 35786

FARMS
35453, 35523, 35525, 35538, 35602, 35857, 36362, 36369, 36392

FEASIBILITY STUDIES
35535, 35545, 35733

FEDERAL GOVERNMENTS
35458, 35544, 35811, 36422, 36426, 36431, 36439, 36440, 36441, 36442, 36477

FEED LOTS
35538, 35739

FERTILIZER MANUFACTURING
35499, 35548, 35641, 35774, 36292, 36381

FIELD TESTS
35463, 35658, 35815, 35869, 35876, 35892, 35909, 35913, 35945, 36071, 36171

FILTER FABRICS
35487, 35592, 35594, 35596, 35629, 35630, 35633, 35681, 35708, 35758, 35767, 35782, 35786, 35847, 35852, 35853, 35854, 35863, 35882, 35884, 35898, 36129

FILTERS
35487, 35592, 35593, 35594, 35595, 35596, 35614, 35624, 35629, 35630, 35633, 35655, 35659, 35667, 35681, 35682, 35693, 35702, 35708, 35758, 35767, 35769, 35782, 35786, 35839, 35847, 35852, 35853, 35854, 35855, 35863, 35873, 35882, 35884, 35898, 35998, 36129, 36479

FINLAND
35507, 36013

FIRING METHODS
35440, 35446, 35483, 35485, 35515, 35574, 35580, 35591, 35599, 35603, 35605, 35619, 35645, 35649, 35683, 35691, 35697, 35710, 35723, 35737, 35740, 35746, 35752, 35753, 35761, 35764, 35777, 35785, 36150, 36153, 36169

FLAME AFTERBURNERS
35599, 35604, 35642, 35700, 35716, 35729, 35776

FLAME IONIZATION DETECTOR
35719, 35796, 35825, 35889, 35898, 35916, 35926, 35944, 36509

FLARES
35725

FLORIDA
36378, 36446

FLOW RATES
35459, 35510, 35584, 35596, 35624, 35748, 35839, 35850, 35862, 35872, 35923, 35933, 35946, 36039, 36057, 36085, 36133, 36135, 36195, 36332

FLOWERS
36364, 36370, 36373

FLOWMETERS
35872, 35923

FLUID FLOW
35446, 35459, 35510, 35584, 35587, 35596, 35600, 35624, 35721, 35748, 35810, 35820, 35839, 35850, 35862, 35872, 35923, 35933, 35943, 35946, 36038, 36039, 36048, 36057, 36085, 36097, 36125, 36129, 36133, 36135, 36145, 36163, 36173, 36193, 36195, 36199, 36207, 36211, 36332, 36338

FLUORANTHENES
35989

FLUORENES
36180

FLUORESCENCE
35798, 35805, 35848, 35860, 35861, 35863, 35867, 35881, 35894, 35896, 35905, 35929, 36139, 36151, 36157, 36166

FLUORIDES
35452, 35477, 35511, 35590, 35641, 35663, 35728, 35769, 35836, 35849, 35934, 35954, 35998, 36049, 36168, 36343, 36344, 36363, 36368, 36379, 36394

FLUORINATED HYDROCARBONS
35675, 36386

FLUORINE
35490, 35641, 35774, 36358, 36381, 36385

FLUORINE COMPOUNDS
35452, 35477, 35511, 35590, 35641, 35663, 35728, 35769, 35774, 35836, 35849, 35910, 35934, 35954, 35998, 36049, 36094, 36168, 36343, 36344, 36363, 36368, 36379, 36381, 36386, 36394

FLY ASH
35455, 35514, 35562, 35584, 35684, 35685, 35737, 35742, 35777, 35782, 35965, 36403

FOG
36034, 36088

FOOD AND FEED OPERATIONS
35453, 35482, 35499, 35518, 35523, 35525, 35538, 35739, 35956, 36006, 36019, 36081, 36452

FOODS
36307

FORESTS
36344, 36357, 36358, 36379

FORMALDEHYDES
35470, 35471, 35485, 35509, 35824, 35927, 35934, 36004, 36246

FRACTIONATION
35695

FRANCE
35440, 35467, 35496, 35515, 35588, 35603, 35613, 35618, 35621, 35624, 35638, 35645, 35669, 35686, 35695, 35697, 35709, 35712, 35714, 35726, 35737, 35757, 35775, 35814, 35900, 35916, 35955, 36012, 36015, 36051, 36065, 36088, 36093, 36103, 36114, 36159, 36196, 36248, 36257, 36266, 36348, 36395, 36410, 36411, 36417, 36454, 36459, 36499, 36509

FREE RADICALS
35976, 36148, 36212, 36244, 36257

FROTH FLOATATION
35676

FRUITS
36306, 36368

FUEL ADDITIVES
35467, 35491, 35625, 35626, 35694, 35702, 35709, 35740, 35754, 35776, 35780, 36141

FUEL CELLS
35440

FUEL CRITERIA
36454

FUEL EVAPORATION
35524, 35539, 35647, 35718, 35727, 35731, 36433, 36435

FUEL GASES
35440, 35463, 35494, 35496, 35520, 35521, 35530, 35564, 35632, 35640, 35659, 35697, 35709, 35713, 35732, 35760, 35761, 35764, 35771, 36107, 36203, 36500

FUEL OIL PREPARATION
35618, 35631, 35656, 35668, 35692, 35695, 35711, 35726, 35773, 36166, 36406

FUEL OILS
35467, 35470, 35490, 35494, 35500, 35511, 35520, 35530, 35548, 35585, 35605, 35618, 35626, 35631, 35640, 35649, 35656, 35662, 35668, 35686, 35692, 35695, 35709, 35712, 35726, 35737, 35755, 35761, 35764, 35773, 35965, 35981, 36094, 36150, 36158, 36166, 36406, 36472

FUEL STANDARDS
35949, 36449, 36462, 36470

FUEL TANK EVAPORATION
35718, 35727, 36433, 36435

FUMES
35574, 35576, 35769, 35770, 35778, 35786, 35841

FUNGI
35447, 36334

FURNACES
35471, 35483, 35494, 35496, 35501, 35541, 35564, 35581, 35583, 35585, 35590, 35597, 35598, 35599, 35607, 35633, 35644, 35645, 35649, 35655, 35667, 35672, 35683, 35689, 35705, 35735, 35742, 35763, 35769, 35777, 35782, 35786, 35794, 35858, 35968, 36049, 36203, 36416

G

GAS CHROMATOGRAPHY
35445, 35473, 35551, 35719, 35759, 35796, 35802, 35807, 35812, 35818, 35825, 35836, 35875, 35877, 35885, 35889, 35891, 35898, 35916, 35926, 35942, 35944, 35952, 35994, 36443, 36509

GAS SAMPLING
35743, 35811, 35818, 35829, 35850, 35864, 35873, 35880, 35884, 35897, 35909, 35910, 35918, 35921, 35923, 35933, 35934, 35938, 35946, 35998, 36017

GAS TURBINES
35517, 35539, 35567, 35589, 35610, 35618, 35733, 35735, 35746, 35754, 35761, 35765, 35771, 35780, 35962, 36414

GASIFICATION (SYNTHESIS)
35441, 35618, 35668, 35726, 36181

GASOLINES
35440, 35472, 35491, 35492, 35509, 35511, 35625, 35626, 35647, 35701, 35718, 35740, 35749, 35771, 36010, 36140, 36141, 36178, 36198, 36433, 36435, 36467

GENETICS
36316, 36321, 36345, 36355

GEORGIA
36436

GERMANY
35458, 35459, 35604, 35659, 35678, 35699, 35706, 35720, 35721, 35758, 35761, 35767, 35794, 35801, 35807, 35809, 35815, 35816, 35858, 35903, 35911, 35917, 35925, 35939, 36040, 36049, 36052, 36079, 36081, 36091, 36094, 36109, 36112, 36116, 36165, 36191, 36195, 36201, 36224, 36282, 36308, 36309, 36310, 36311, 36312, 36315, 36318, 36322, 36395, 36417, 36429, 36455, 36456, 36461, 36465, 36476, 36481, 36506, 36512

GLANDS
36216, 36226, 36309, 36387

GLASS
35468, 35483, 35583, 35597

GLASS FABRICS
35592, 35596, 35782, 35852, 35853, 35854, 35882, 35884

GRAIN PROCESSING
36019

GRANTS
36439

GRAPHITE
36201

GRASSES
36353, 36384

GRAVITY SETTLING
35598, 35630, 35720, 35870

GREAT BRITAIN
35452, 35453, 35457, 35493, 35571, 35626, 35707, 35746, 35792, 35899, 35935, 35941, 35951, 36046, 36078, 36096, 36100, 36101, 36111, 36123, 36146, 36192, 36212, 36214, 36222, 36223, 36233, 36241, 36243, 36252, 36255, 36261, 36274, 36328, 36341, 36347, 36349, 36359, 36395, 36408, 36409, 36412, 36453, 36477, 36482, 36489

GROUND LEVEL
35455, 35489, 35800, 35857, 36013, 36030, 36041, 36044, 36046, 36056, 36057, 36066, 36089, 36094, 36096, 36101, 36108, 36114, 36127, 36419, 36511

GUINEA PIGS
36245, 36251, 36319

H

HALOGEN GASES
35477, 35490, 35641, 35675, 35763, 35774, 35775, 35915, 35934, 35942, 36017, 36087, 36123, 36358, 36381, 36385, 36394, 36422

HALOGENATED HYDROCARBONS
35479, 35504, 35533, 35675, 35736, 35777, 35808, 35890, 35938, 35947, 36009, 36228, 36229, 36386

HAMSTERS
36256, 36323

HARBORS
35902, 36059

HAWAII
36017

HEADACHE
36305

HEALTH IMPAIRMENT
35986, 36011, 36223, 36236, 36250, 36253, 36254, 36263, 36266, 36269, 36275, 36279, 36283, 36287, 36288, 36289, 36290, 36291, 36295, 36296, 36304, 36305, 36306, 36327, 36340, 36358, 36374, 36423, 36471, 36508, 36509, 36511, 36515

HEALTH STATISTICS
35502, 36010, 36238, 36260, 36273, 36285, 36291, 36320, 36326

HEARINGS
35450, 36424, 36463, 36486

HEART
36286

HEAT OF COMBUSTION
36183

HEAT TRANSFER
35459, 35558, 35568, 35576, 35604, 35607, 35611, 35612, 35621, 35650, 35653, 35669, 35689, 35690, 35721, 35723, 35903, 36029, 36190, 36203, 36209

HEIGHT FINDING
36036, 36046, 36506, 36514

HEMATOLOGY
35492, 36010, 36187, 36215, 36220, 36230, 36231, 36233, 36238, 36243, 36247, 36248, 36250, 36253, 36268, 36271, 36286, 36292, 36311, 36318, 36335, 36337, 36339, 36421

HEMOGLOBIN INTERACTIONS
36187, 36233, 36286, 36292

HERBICIDES
36054

HERBS
36354

HEXANES
35859, 35927, 36224, 36228, 36229

HI-VOL SAMPLERS
35844, 35847, 35853, 35854, 35884, 35922, 35980

HIGHWAYS
35492, 35497, 35524, 35527, 35528, 35972, 35974, 35986, 35992, 36001, 36005, 36011, 36043, 36098, 36104, 36110, 36283, 36296, 36347, 36371, 36377

HOGS
35499, 35956

HOT SOAK
35539

HUMIDITY
35445, 35526, 35575, 35801, 35887, 35905, 35928, 35951, 35980, 36025, 36051, 36064, 36067, 36080, 36091, 36159, 36182, 36202, 36255, 36260, 36274, 36389, 36398, 36399

HYDRAZINES
36133, 36210

HYDROCHLORIC ACID
35475, 35753, 35777, 35927, 36394

HYDROCYANIC ACID
35475, 35493, 36206

HYDRODESULFURIZATION
35618, 35656, 35668, 35695, 35773, 36406

HYDROFLUORIC ACID
35469, 35777, 36232, 36358, 36416, 36420

HYDROGEN
35441, 35443, 35477, 35616, 35719, 35732, 35740, 35802, 35884, 35939, 36033, 36087, 36155

HYDROGEN SULFIDE
35478, 35481, 35482, 35499, 35559, 35565, 35572, 35575, 35581, 35613, 35616, 35622, 35627, 35672, 35713, 35755, 35788, 35789, 35813, 35832, 35889, 35898, 35915, 35945, 35956, 36092, 36186, 36206, 36337, 36389, 36394, 36396, 36399

HYDROGENATION
35618

HYDROLYSIS
35572

HYDROSPHERE
35947, 35953, 36032, 36059, 36097, 36105

HYDROXIDES
35531, 35741, 36160, 36184, 36234

I

ICE
36027, 36029, 36031, 36075, 36115, 36118, 36120

ILLINOIS
35542, 36107, 36260, 36447

IMMUNOLOGY
36221, 36226, 36329

IMPINGERS
35824, 35828, 35847, 35853

INCINERATION
35446, 35458, 35471, 35475, 35479, 35504, 35542, 35543, 35547, 35548, 35564, 35599, 35603, 35605, 35655, 35688, 35710, 35714, 35725, 35727, 35753, 35762, 35770, 35785, 35946, 36013, 36019

INDIANA
36070, 36447

INDOOR
35595, 35874, 35948, 35969, 35985, 35993, 36015, 36020

INDUSTRIAL AREAS
35469, 35474, 35478, 35481, 35482, 35498, 35522, 35655, 35686, 35949, 35954, 35955, 35964, 35965, 35971, 35979, 35984, 35988, 35990, 35998, 35999, 36001, 36003, 36009, 36011, 36015, 36059, 36061, 36072, 36073, 36077, 36085, 36101, 36102, 36103, 36247, 36250, 36263, 36292, 36343, 36344, 36363, 36368, 36371, 36375, 36381, 36388, 36392, 36394, 36399, 36401, 36425, 36456, 36466, 36500

INERTIAL SEPARATION
35629, 35630, 35911

INFECTIOUS DISEASES
36314, 36334

INFLUENZA
36275, 36314

INFRARED RADIATION
36142, 36376

INFRARED SPECTROMETRY
35443, 35466, 35473, 35486, 35805, 35808, 35827, 35907, 35909, 35920, 35927, 35931, 36142, 36165, 36177, 36202

INGESTION
36278, 36318

INHIBITION
36223, 36299, 36308, 36315

INORGANIC ACIDS
35469, 35475, 35548, 35622, 35641, 35667, 35735, 35753, 35774, 35777, 35839, 35852, 35888, 35927, 35953, 35960, 36015, 36024, 36088, 36159, 36232, 36358, 36389, 36394, 36397, 36416, 36420, 36509

INSPECTION
35593, 36457, 36467

INSTRUMENTATION
35486, 35532, 35542, 35586, 35757, 35759, 35796, 35797, 35806, 35811, 35812, 35814, 35818, 35821, 35829, 35831, 35832, 35833, 35838, 35842, 35850, 35861, 35864, 35869, 35871, 35872, 35874, 35887, 35897, 35899, 35900, 35904, 35907, 35908, 35909, 35919, 35920, 35922, 35926, 35927, 35928, 35930, 35932, 35933, 35944, 35995, 36037, 36112, 36126, 36195, 36207, 36338, 36346, 36410, 36488, 36496, 36508

INTERNAL COMBUSTION ENGINES
35440, 35454, 35457, 35466, 35472, 35503, 35519, 35539, 35552, 35553, 35554, 35556, 35557, 35558, 35567, 35570, 35588, 35591, 35609, 35611, 35621, 35625, 35626, 35628, 35642, 35650, 35665, 35666, 35682, 35683, 35690, 35694, 35700, 35703, 35730, 35733, 35740, 35743, 35748, 35749, 35768, 35771, 35816, 36013, 36015, 36146, 36150, 36190, 36441

INVERSION
35467, 35480, 35800, 36021, 36024, 36026, 36028, 36036, 36042, 36044, 36077, 36094, 36108, 36330, 36511

IODIDES
35675

IODIMETRIC METHODS
35880

IODINE
35675

IODINE COMPOUNDS
35675, 36017

IONS
35562, 35855, 35962, 35999, 36002, 36020, 36093, 36115, 36123, 36142, 36161, 36177, 36186, 36206, 36208, 36396, 36471

IOWA
35623, 36419

IRON
35555, 35633, 35642, 35663, 35725, 35735, 35769, 35849, 35949, 35971, 36019, 36388, 36389, 36392, 36393, 36398, 36399, 36400, 36401, 36423

IRON COMPOUNDS
35466, 35501, 35684, 35685, 35704, 35705, 35769, 35848, 35854, 35863, 35906, 35958, 35963, 35979, 35982, 35984, 35988, 35990, 35996, 36000, 36001, 36008, 36187, 36262, 36331, 36375, 36383

IRON OXIDES
35584, 36402, 36420

IRRADIATION CHAMBERS
35833, 35972

ISOTOPES
35460, 36151, 36234, 36314

ITALY
35492, 35633, 36037, 36145, 36204, 36231, 36313, 36325, 36405, 36406, 36417, 36440

J

JAPAN
35442, 35444, 35466, 35469, 35470, 35471, 35472, 35473, 35474, 35475, 35477, 35478, 35479, 35480, 35481, 35482, 35483, 35484, 35485, 35494, 35495, 35497, 35498, 35499, 35500, 35501, 35504, 35506, 35508, 35509, 35510, 35522, 35524, 35531, 35546, 35574, 35577, 35578, 35579, 35580, 35581, 35585, 35586, 35593, 35595, 35596, 35597, 35598, 35627, 35630, 35637, 35639, 35646, 35649, 35651, 35652, 35653, 35655, 35656, 35657, 35660, 35662, 35663, 35668, 35672, 35679, 35681, 35683, 35694, 35696, 35704, 35705, 35711, 35715, 35716, 35722, 35740, 35743, 35748, 35749, 35751, 35755, 35823, 35824, 35827, 35838, 35839, 35840, 35841, 35842, 35843, 35846, 35847, 35848, 35849, 35850, 35852, 35853, 35854, 35855, 35856, 35859, 35860, 35861, 35862, 35863, 35864, 35865, 35866, 35868, 35869, 35870, 35871, 35872, 35875, 35876, 35877, 35882, 35884, 35885, 35886, 35887, 35888, 35889, 35890, 35892, 35893, 35898, 35907, 35914, 35949, 35954, 35956, 35958, 35960, 35961, 35962, 35963, 35964, 35965, 35966, 35967, 35969, 35970, 35971, 35972, 35973, 35974, 35975, 35976, 35977, 35979, 35980, 35981, 35982, 35983, 35984, 35985, 35986, 35987, 35988, 35989, 35990, 35991, 35992, 35994, 35996, 35998, 35999, 36000, 36001, 36002, 36003, 36004, 36005, 36009, 36011, 36014, 36033, 36041, 36042, 36043, 36045, 36047, 36048, 36057, 36058, 36059, 36060, 36061, 36062, 36063, 36064, 36069, 36070, 36071, 36072, 36073, 36074, 36077, 36082, 36083, 36084, 36085, 36086, 36121, 36132, 36153, 36154, 36156, 36158, 36166, 36167, 36169, 36170, 36171, 36172, 36175, 36228, 36229, 36253, 36254, 36258, 36263, 36264, 36267, 36269, 36270, 36271, 36272, 36273, 36277, 36279, 36281, 36283, 36287, 36288, 36290, 36291, 36293, 36295, 36296, 36297, 36302, 36304, 36305, 36306, 36324, 36346, 36352, 36353, 36354, 36357, 36360, 36361, 36362, 36363, 36364, 36365, 36366, 36368, 36369, 36370, 36372, 36373, 36374, 36375, 36376, 36377, 36381, 36389, 36390, 36391, 36392, 36393, 36394, 36395, 36397, 36399, 36400, 36401, 36416, 36429, 36460, 36462, 36466, 36470, 36471, 36474, 36479, 36507, 36508, 36510, 36511

JET AIRCRAFT
35464, 35466, 35480, 35489, 35517, 35529, 35533, 35680, 35734, 35752, 35754, 35843, 35865, 35875, 35962, 35970, 35987, 35989, 35994, 36000, 36005, 36025, 36067, 36090, 36499

K

KANAGAWA PREFECTURE
35886, 35980, 35991, 35992, 36001, 36011, 36064, 36283, 36291, 36306, 36362

KANSAS
36469

KEROSENE
35494, 35603, 35649, 35703

KETONES
35822, 35938, 36229

KIDNEYS
36269, 36309

KILNS
35468, 35471, 35597, 35605, 35634, 35639, 35664, 35742, 35747, 35868

KRAFT PULPING
35444, 35462, 35478, 35507, 35522, 35551, 35559, 35605, 35617, 35622, 35627, 35725, 35788, 35945, 35971, 36405, 36423, 36445

L

LABORATORY ANIMALS
35516, 36216, 36221, 36222, 36224, 36226, 36232, 36234, 36235, 36244, 36245, 36247, 36251, 36256, 36261, 36264, 36268, 36269, 36275, 36278, 36286, 36289, 36293, 36294, 36298, 36299, 36309, 36312, 36314, 36316, 36317, 36318, 36319, 36323, 36324, 36328, 36329, 36332, 36421

LABORATORY FACILITIES
35445, 35753, 35832, 36209

LACQUERS
35458

LAKES
35512, 36022, 36113, 36342

LAND USE
35498, 35535, 35600, 35706, 36097, 36111, 36348, 36455, 36456, 36500

LANDFILLS
35443, 35543

LASERS
35808, 35815, 35817, 35896, 35905, 35913, 35927, 35929, 35931, 35943, 36063, 36139, 36151, 36207, 36509

LAUNDERING (COAL)
35623, 36403

LEAD
36019

LEAD COMPOUNDS
35455, 35458, 35491, 35492, 35501, 35506, 35511, 35531, 35537, 35609, 35625, 35626, 35769, 35776, 35841, 35854, 35863, 35874, 35882, 35906, 35958, 35963, 35973, 35979, 35984, 35988, 35990, 35996, 36000, 36001, 36008, 36009, 36010, 36012, 36027, 36113, 36123, 36140, 36141, 36178, 36223, 36227, 36231, 36238, 36243, 36250, 36268, 36284, 36319, 36321, 36347, 36349, 36353, 36359, 36371, 36375, 36416, 36420, 36515

LEAVES
35881, 36033, 36265, 36344, 36350, 36351, 36356, 36359, 36361, 36362, 36363, 36365, 36366, 36368, 36373, 36375, 36377, 36378, 36380, 36382, 36383

LEGISLATION
35453, 35567, 35724, 36018, 36407, 36413, 36416, 36424, 36426, 36428, 36430, 36438, 36440, 36443, 36452, 36460, 36477, 36478, 36485, 36489, 36503, 36507

LEUKOCYTES
36272

LIDAR
35797, 35815, 35817, 35896, 35905, 35936, 36058, 36063

LIFE SPAN
36269

LIGHT SCATTERING
35896, 35905, 35913, 35924, 35929, 35936, 35943, 35995, 36039, 36050, 36057, 36063, 36109, 36112, 36116, 36204, 36207, 36213

LIME
35605, 35634, 35742, 35747, 35868

LIMESTONE
35634

LINE SOURCES
35527, 36043, 36055, 36098, 36104

LIPIDS
36264, 36322

LITHIUM COMPOUNDS
35562

LITIGATION
36428

LIVER
36222, 36224, 36231, 36265, 36309

LOCAL GOVERNMENTS
36439

LONDON
35935, 36100, 36222, 36255, 36274

LOS ANGELES
35458, 35948, 35952, 35995, 36068, 36340, 36430, 36457, 36473, 36489, 36515

LOWER ATMOSPHERE
35460, 35489, 35800, 35817, 35936, 36013, 36021, 36041, 36058, 36059, 36066, 36067, 36075, 36083, 36112, 36114, 36208, 36508

LUNG CANCER
36222, 36241, 36303, 36313, 36324, 36328, 36330, 36515

LUNG CLEARANCE
36218, 36261, 36278, 36291, 36314, 36317, 36319, 36336, 36338

LUNGS
36222, 36241, 36244, 36249, 36257, 36259, 36261, 36264, 36272, 36276, 36294, 36298, 36299, 36303, 36309, 36313, 36317, 36319, 36324, 36332, 36341

LYMPHOCYTES
36226

M

MAGNESIUM COMPOUNDS
35584, 35715, 35763, 35790, 36113, 36177, 36331

MAGNETIC PROPERTIES
35651

MAINTENANCE
35533, 35560, 35592, 35593, 35596, 35605, 35698, 35708, 35716, 35725, 35782, 35829, 35920, 35926, 36457, 36467

MANGANESE COMPOUNDS
35466, 35501, 35506, 35575, 35578, 35681, 35705, 35803, 35854, 35863, 35906, 35958, 35963, 35973, 35979, 35982, 35984, 35988, 35990, 35996, 36001, 36005, 36008, 36009, 36227, 36300, 36331, 36353, 36375

MAPPING
35526, 35550, 35831, 35929, 35967, 35971, 36343, 36346

MARYLAND
36433, 36467

MASS SPECTROMETRY
35551, 35802, 35855, 35925

MASS TRANSPORTATION
35440, 35670, 36407, 36434, 36467

MASSACHUSETTS
36433, 36472

MATHEMATICAL ANALYSES
35446, 35449, 35459, 35476, 35486, 35534, 35541, 35553, 35554, 35556, 35557, 35558, 35563, 35587, 35594, 35600, 35601, 35616, 35630, 35658, 35671, 35699, 35728, 35787, 35800, 35801, 35809, 35810, 35814, 35820, 35835, 35841, 35861, 35876, 35911, 35924, 35943, 35966, 35971, 35975, 36024, 36025, 36035, 36036, 36038, 36039, 36043, 36045, 36046, 36047, 36050, 36053, 36056, 36065, 36069, 36078, 36080, 36082, 36087, 36089, 36091, 36094, 36096, 36098, 36099, 36100, 36104, 36108, 36109, 36114, 36116, 36118, 36119, 36120, 36124, 36125, 36127, 36129, 36134, 36135, 36136, 36137, 36138, 36140, 36142, 36145, 36146, 36157, 36162, 36163, 36164, 36165, 36171, 36173, 36176, 36181, 36184, 36185, 36188, 36189, 36190, 36195, 36196, 36197, 36199, 36200, 36203, 36204, 36205, 36218, 36229, 36336, 36404, 36408, 36483, 36502, 36514

MATHEMATICAL MODELING
35534, 35554, 35558, 35820, 35835, 35841, 35975, 36024, 36025, 36036, 36047, 36053, 36056, 36065, 36080, 36087, 36089, 36094, 36100, 36114, 36124, 36135, 36136, 36176, 36188, 36189, 36195, 36196, 36218, 36404, 36483, 36502

MAXIMUM ALLOWABLE CONCENTRATION
35595, 35822, 35853, 36454, 36461, 36462, 36477

MBTH METHOD
35839, 35994

MEETINGS
35521, 36087

MEMBRANE FILTERS
35639, 35677, 35820, 35841, 35853, 35860, 35914, 35953, 35954

MEMBRANES
35639, 36220, 36241, 36245, 36262, 36272, 36298, 36350, 36382

MERCAPTANS
35478, 35482, 35499, 35622, 35627, 35711, 35889, 35898, 35945, 36175, 36394, 36399

MERCURY
35549

MERCURY COMPOUNDS
35441, 35455, 35458, 35490, 35506, 35537, 35542, 35549, 35819, 35828, 35874, 35908, 35939, 36123, 36234, 36265, 36339

METABOLISM
36230, 36232, 36321, 36327, 36344, 36386

METAL COMPOUNDS
35441, 35455, 35458, 35466, 35468, 35490, 35491, 35492, 35501, 35506, 35511, 35531, 35533, 35537, 35542, 35549, 35562, 35563, 35565, 35575, 35578, 35584, 35590, 35601, 35609, 35625, 35626, 35642, 35663, 35672, 35681, 35684, 35685, 35692, 35694, 35704, 35705, 35715, 35728, 35741, 35745, 35751, 35763, 35766, 35769, 35776, 35790, 35802, 35803, 35819, 35828, 35839, 35841, 35848, 35854, 35863, 35874, 35879, 35881, 35882, 35884, 35888, 35904, 35906, 35908, 35939, 35954, 35958, 35963, 35973, 35979, 35982, 35984, 35988, 35989, 35990, 35996, 36000, 36001, 36003, 36005, 36008, 36009, 36010, 36011, 36012, 36017, 36022, 36027, 36031, 36033, 36087, 36113, 36114, 36115, 36123, 36140, 36141, 36177, 36178, 36187, 36223, 36227, 36231, 36234, 36238, 36243, 36250, 36262, 36265, 36268, 36278, 36279, 36284, 36299, 36300, 36301, 36317, 36319, 36321, 36326, 36331, 36339, 36342, 36347, 36349, 36352, 36353, 36354, 36359, 36371, 36372, 36375, 36383, 36387, 36394, 36416, 36420, 36515

METAL FABRICATING AND FINISHING
35452, 35471, 35474, 35548, 35599, 35686, 35706, 35725, 35728, 35841, 35873, 35971, 36049, 36103, 36354, 36368, 36381, 36416, 36423

METAL POISONING
36010, 36234, 36238, 36250, 36284, 36299, 36339

METALS
35452, 35473, 35520, 35540, 35549, 35555, 35590, 35599, 35633, 35642, 35663, 35677, 35706, 35725, 35728, 35735, 35763, 35769, 35770, 35772, 35828, 35849, 35873, 35949, 35971, 36019, 36022, 36049, 36188, 36235, 36344, 36354, 36368, 36381, 36388, 36389, 36391, 36392, 36393, 36394, 36395, 36397, 36398, 36399, 36400, 36401, 36423, 36453

METEOROLOGICAL INSTRUMENTS
35721, 35913, 36037, 36041, 36488

METEOROLOGY
35445, 35455, 35476, 35480, 35500, 35510, 35526, 35527, 35528, 35538, 35575, 35601, 35675, 35709, 35755, 35800, 35801, 35869, 35887, 35902, 35905, 35928, 35936, 35949, 35951, 35952, 35954, 35955, 35959, 35971, 35972, 35980, 35985, 36017, 36018, 36021, 36022, 36024, 36025, 36026, 36027, 36028, 36029, 36030, 36031, 36032, 36034, 36036, 36037, 36039, 36040, 36041, 36042, 36043, 36044, 36045, 36046, 36049, 36051, 36053, 36054, 36056, 36057, 36058, 36059, 36060, 36061, 36062, 36063, 36064, 36066, 36067, 36070, 36071, 36072, 36073, 36074, 36075, 36076, 36077, 36079, 36080, 36081, 36082, 36083, 36084, 36085, 36086, 36087, 36088, 36089, 36090, 36091, 36094, 36095, 36096, 36097, 36098, 36099, 36100, 36101, 36102, 36103, 36104, 36105, 36106, 36107, 36108, 36111, 36113, 36114, 36115, 36117, 36118, 36119, 36120, 36127, 36135, 36143, 36144, 36159, 36176, 36179, 36182, 36190, 36196, 36197, 36202, 36225, 36255, 36260, 36267, 36274, 36288, 36296, 36320, 36326, 36330, 36342, 36368, 36373, 36389, 36393, 36398, 36399, 36401, 36423, 36425, 36451, 36456, 36458, 36459, 36465, 36476, 36481, 36482, 36488, 36498, 36500, 36506, 36511, 36515

METHANES
35443, 35463, 35675, 35719, 35732, 35796, 35831, 35907, 35926, 35927, 35944, 36092, 36168, 36195, 36210

MICE
35516, 36221, 36224, 36226, 36261, 36275, 36314, 36316, 36323, 36324, 36329

MICHIGAN
36447

MICROMETEOROLOGY
35527, 35528, 36018, 36021, 36040

MICROORGANISMS
35443, 35447, 35830, 35941, 35969, 36039, 36221, 36226, 36275, 36297, 36314, 36319, 36323, 36334, 36396

MICROSCOPY
35830, 35917, 35953

MIDDLE ATMOSPHERE
35460, 35489, 35913, 36025, 36053, 36066, 36067, 36149, 36160, 36208

MINERAL PROCESSING
35468, 35469, 35477, 35483, 35487, 35502, 35549, 35566, 35583, 35597, 35602, 35724, 35784, 35789, 35944, 35949, 36015, 36019, 36076, 36236, 36262, 36280, 36304, 36312, 36341, 36352, 36445

MINING
35502, 35549, 35566, 35724, 35789, 35944, 36015, 36304, 36312, 36352

MINNESOTA
36447

MISSILES AND ROCKETS
35741, 35902, 36124, 36133

MISSOURI
36021, 36070, 36106, 36464

MISTS
35592, 35608, 35839, 35852, 35888, 35960, 36002, 36047, 36394

MOLYBDENUM COMPOUNDS
36227

MONITORING
35500, 35510, 35531, 35532, 35560, 35686, 35706, 35755, 35797, 35798, 35805, 35811, 35815, 35821, 35823, 35829, 35832, 35834, 35844, 35846, 35848, 35857, 35858, 35863, 35866, 35868, 35872, 35886, 35892, 35896, 35897, 35902, 35905, 35908, 35909, 35915, 35916, 35919, 35929, 35931, 35932, 35934, 35936, 35937, 35939, 35940, 35946, 35950, 35955, 35957, 35965, 35982, 35987, 36007, 36020, 36041, 36046, 36063, 36073, 36092, 36429, 36451, 36458, 36459, 36461, 36465, 36476, 36480, 36481, 36483, 36487, 36496, 36509

MONTANA
36031, 36343

MONTHLY
35958, 35959, 35960, 35964, 35973, 35999, 36009, 36011, 36077, 36080, 36097, 36306, 36393, 36474

MORBIDITY
36253, 36254, 36263, 36266, 36267, 36272, 36273, 36279, 36281, 36287, 36293, 36295, 36296, 36302, 36305, 36307, 36312, 36342, 36374, 36421

MORTALITY
36260, 36266, 36267, 36269, 36280, 36307, 36316, 36342, 36421

MOTTLING
36369, 36370

MOUNTAINS
35801, 36031, 36075, 36091, 36179

MULTIPLE CHAMBER INCINERATORS
35547

MUTATIONS
36316

N

NATIONAL AIR SAMPLING NETWORK (NASN)
36007, 36008

NATURAL GAS
35440, 35463, 35494, 35496, 35520, 35521, 35530, 35632, 35697, 35709, 35713, 35760, 35761, 35764, 35771, 36107, 36203, 36500

NECROSIS
36348, 36351, 36355, 36362, 36364, 36369, 36381, 36384, 36385

NERVOUS SYSTEM
36011, 36234, 36242, 36246, 36318, 36327, 36335

NETHERLANDS
35536, 35565, 35643, 35687, 35764, 35910, 36018, 36075, 36079, 36080, 36102, 36238, 36256, 36303, 36427, 36429, 36458, 36477

NEUTRAL CONDITION
36101

NEUTRON ACTIVATION ANALYSIS
35803, 35914

NEVADA
36463

NEW HAMPSHIRE
36449

NEW JERSEY
35952, 36433

NEW YORK CITY
35950, 35952, 36110

NEW YORK STATE
35458, 35950, 35952, 36110, 36438

NICKEL
36022, 36399

NICKEL COMPOUNDS
35490, 35501, 35642, 35854, 35884, 35904, 35973, 35979, 35982, 35988, 35990, 35996, 36000, 36001, 36003, 36008, 36009, 36022, 36177, 36227, 36371, 36375

NITRATES
35480, 35825, 35826, 35927, 35976, 35977, 36033, 36117, 36121, 36198, 36214, 36230, 36362, 36369, 36370, 36382

NITRIC ACID
35735, 36015, 36159, 36394

NITRIC ANHYDRIDE (N2O5)
36394

NITRIC OXIDE (NO)
35440, 35464, 35466, 35480, 35483, 35486, 35494, 35496, 35510, 35528, 35571, 35578, 35597, 35609, 35657, 35665, 35666, 35681, 35694, 35697, 35734, 35740, 35748, 35751, 35821, 35832, 35863, 35871, 35907, 35909, 35919, 35927, 35930, 35948, 35960, 35976, 35981, 35986, 35991, 36000, 36004, 36015, 36025, 36092, 36121, 36131, 36136, 36142, 36146, 36152, 36153, 36155, 36157, 36174, 36177, 36187, 36189, 36212, 36213, 36290, 36383, 36394, 36430, 36511

NITRILES
35473, 35713

NITRITES
35480, 36033

NITROGEN
35443, 35463, 35490, 35597, 35616, 35944, 36087, 36113, 36131, 36133, 36136, 36158, 36171, 36292

NITROGEN DIOXIDE (NO2)
35471, 35480, 35510, 35578, 35597, 35657, 35681, 35740, 35815, 35821, 35823, 35832, 35865, 35866, 35871, 35876, 35893, 35895, 35896, 35908, 35918, 35919, 35927, 35929, 35930, 35935, 35937, 35948, 35960, 35965, 35976, 35981, 35986, 35992, 35999, 36000, 36004, 36015, 36018, 36088, 36092, 36121, 36139, 36148, 36152, 36157, 36161, 36164, 36171, 36173, 36177, 36184, 36186, 36189, 36192, 36213, 36214, 36219, 36221, 36272, 36290, 36311, 36324, 36332, 36394, 36416, 36420, 36421, 36422, 36430, 36508, 36511

NITROGEN OXIDES
35440, 35442, 35443, 35456, 35464, 35466, 35470, 35471, 35472, 35475, 35480, 35483, 35484, 35485, 35486, 35487, 35488, 35494, 35496, 35508, 35510, 35511, 35514, 35517, 35519, 35528, 35529, 35531, 35534, 35539, 35550, 35552, 35571, 35574, 35577, 35578, 35579, 35580, 35581, 35583, 35589, 35591, 35597, 35603, 35609, 35610, 35611, 35619, 35621, 35625, 35628, 35632, 35640, 35649, 35650, 35653, 35657, 35662, 35665, 35666, 35675, 35679, 35680, 35681, 35683, 35687, 35691, 35694, 35696, 35697, 35700, 35704, 35707, 35723, 35734, 35738, 35740, 35746, 35748, 35749, 35751, 35752, 35753, 35754, 35760, 35765, 35815, 35821, 35823, 35827, 35829, 35832, 35834, 35863, 35864, 35865, 35866, 35871, 35876, 35893, 35895, 35896, 35907, 35908, 35909, 35918, 35919, 35927, 35929, 35930, 35934, 35935, 35937, 35948, 35952, 35960, 35961, 35965, 35967, 35968, 35976, 35981, 35982, 35986, 35987, 35991, 35992, 35999, 36000, 36001, 36002, 36004, 36005, 36007, 36015, 36018, 36019, 36025, 36051, 36064, 36067, 36068, 36082, 36088, 36092, 36094, 36117, 36121, 36131, 36133, 36136, 36139, 36142, 36146, 36148, 36151, 36152, 36153, 36155, 36157, 36161, 36164, 36169, 36170, 36171, 36172, 36173, 36174, 36177, 36184, 36186, 36187, 36188, 36189, 36192, 36212, 36213, 36214, 36219, 36221, 36235, 36257, 36272, 36290, 36311, 36320, 36324, 36332, 36379, 36383, 36390, 36392, 36393, 36394, 36397, 36401, 36416, 36417, 36420, 36421, 36422, 36430, 36441, 36459, 36462, 36473, 36486, 36488, 36508, 36509, 36511

NITROGEN TRIOXIDE (NO3)
35597, 35982, 36002, 36189, 36214, 36390

NITROUS ACID
36015

NITROUS OXIDE (N2O)
35443, 36092, 36133, 36151, 36188, 36192, 36257

NON-URBAN AREAS
35453, 35492, 35523, 35525, 35538, 35602, 35857, 35985, 35988, 35996, 36001, 36008, 36026, 36054, 36243, 36254, 36277, 36283, 36288, 36337, 36362, 36369, 36371, 36388, 36392, 36456, 36458

NORTH DAKOTA
35544

NORWAY
36044

NOSTRILS
36245, 36340

NUCLEAR EXPLOSIONS
36067, 36179

NUCLEAR POWER PLANTS
35520, 35530, 35756, 36484, 36485, 36500, 36513

NUCLEAR POWER SOURCES
35686, 35709, 35737, 35756, 36094

NUCLEATION
35869, 35943, 36027, 36029, 36031, 36075, 36117, 36118, 36120, 36130, 36159, 36162, 36205, 36208

NUCLEIC ACIDS
36323, 36365

NYLON
35777

O

OCEANS
35801, 35869, 35947, 35953, 36017, 36059, 36091, 36097, 36105, 36392, 36498

OCTANES
35556, 35626, 36140, 36141

ODOR COUNTERACTION
35473, 35485, 35605, 35613, 35622, 35627, 36081, 36479, 36507

ODORIMETRY
35795, 35840, 36006

ODORS
35442, 35473, 35478, 35481, 35482, 35485, 35487, 35499, 35522, 35531, 35539, 35559, 35605, 35613, 35622, 35627, 35646, 35727, 35739, 35753, 35755, 35795, 35840, 35889, 35898, 35956, 36006, 36081, 36102, 36175, 36270, 36405, 36443, 36466, 36479, 36507

OHIO
36099, 36501

OIL BURNERS
35655, 35782

OIL RESOURCES
35490, 35626, 35656, 35692

OLEFINS
35473, 35719, 35777, 35808, 35859, 35927, 35952, 36121, 36130, 36180, 36198, 36327

OPEN BURNING
35538, 35573, 35640, 35902, 36019, 36237, 36450

OPEN HEARTH FURNACES
35471

OPERATING CRITERIA
35442

OPERATING VARIABLES
35457, 35459, 35472, 35483, 35494, 35516, 35517, 35553, 35554, 35556, 35557, 35558, 35564, 35589, 35599, 35661, 35662, 35666, 35674, 35704, 35717, 35745, 35753, 35766, 35767, 35768, 35783, 35817, 35856, 35926, 36150, 36156, 36190

OPINION SURVEYS
36006, 36270

OREGON
36436

ORGANIC ACIDS
35475, 35480, 35493, 35516, 35550, 35606, 35885, 35934, 36133, 36206, 36386

ORGANIC NITROGEN COMPOUNDS
35482, 35499, 35609, 35942, 35956, 36180, 36219, 36372

ORGANIC SULFUR COMPOUNDS
35478, 35482, 35499, 35559, 35622, 35623, 35627, 35711, 35755, 35889, 35898, 35945, 36175, 36394, 36399

ORGANIC WASTES
35646, 35739

ORGANOMETALLICS
36123, 36187, 36265

ORSAT ANALYSES
35934

OSAKA
35474, 35480, 35497, 35500, 35546, 35655, 35960, 35964, 35969, 35974, 35981, 36014, 36041, 36043, 36045, 36061, 36070, 36082, 36083, 36086, 36267, 36273, 36287, 36290, 36376, 36462, 36466, 36470

OUTPATIENT VISITS
36285

OVERFIRE AIR
35619, 35777

OXIDANTS
35480, 35500, 35681, 35704, 35859, 35908, 35959, 35960, 35976, 35977, 35981, 35985, 35986, 35991, 36001, 36002, 36007, 36018, 36041, 36060, 36063, 36064, 36086, 36198, 36221, 36272, 36288, 36290, 36296, 36302, 36305, 36306, 36320, 36351, 36360, 36362, 36364, 36369, 36370, 36372, 36373, 36382, 36394, 36416, 36421, 36422, 36462, 36467, 36471, 36475, 36488, 36508, 36511

OXIDATION
35597, 35616, 35721, 35919, 36024, 36088, 36150, 36153, 36175, 36189, 36201, 36212, 36300

OXYGEN
35443, 35445, 35448, 35449, 35463, 35616, 35660, 35675, 35899, 35901, 35944, 36131, 36152, 36161, 36189, 36194, 36208, 36257, 36389, 36397

OXYGENATED FRACTIONS
35701

OZONE
35489, 35627, 35681, 35704, 35708, 35838, 35871, 35896, 35915, 35927, 35948, 35957, 35959, 35977, 36001, 36025, 36041, 36063, 36064, 36067, 36117, 36147, 36152, 36160, 36165, 36183, 36194, 36216, 36220, 36221, 36246, 36257, 36264, 36294, 36298, 36319, 36345, 36350, 36351, 36355, 36356, 36360, 36362, 36365, 36366, 36367, 36370, 36372, 36378, 36379, 36382, 36384, 36394, 36420, 36430, 36508

P

PACKED TOWERS
35576, 35679

PAINT MANUFACTURING
35458, 35485

PAINTS
35458

PAPER MANUFACTURING
35462, 35507, 35605, 35634, 35725

PARIS
36012

PARTICLE COUNTERS
35845, 35853, 35869, 35887, 35913, 35917, 36075

PARTICLE GROWTH
35541, 35608, 35637, 35684, 35685, 35801, 35943, 36029, 36047, 36093, 36119, 36120, 36130, 36134, 36159, 36162, 36163, 36205

PARTICLE SHAPE
35970

PARTICLE SIZE
35455, 35501, 35526, 35601, 35633, 35637, 35653, 35667, 35694, 35705, 35720, 35728, 35787, 35801, 35809, 35814, 35820, 35847, 35854, 35862, 35869, 35870, 35878, 35906, 35913, 35914, 35917, 35922, 35924, 35933, 35943, 35953, 35969, 35970, 35980, 35995, 36029, 36034, 36039, 36047, 36050, 36052, 36056, 36078, 36091, 36109, 36116, 36119, 36126, 36128, 36145, 36163, 36182, 36193, 36205, 36218, 36261, 36289, 36310, 36336

PARTICULATE SAMPLING
35447, 35624, 35799, 35811, 35837, 35846, 35847, 35862, 35873, 35903, 35906, 35910, 35922, 35933, 35946, 35980, 36017, 36027, 36028, 36031

PATHOLOGICAL TECHNIQUES
36232, 36241, 36245, 36313, 36318, 36325

PENNSYLVANIA
35463, 36070, 36320, 36433

PENTANES
35927

PERMEABILITY
35659, 35802, 36129, 36350, 36382

PEROXIDES
35740, 36121

PEROXYACETYL NITRATE
35927, 35977, 36198, 36230, 36362, 36369, 36370, 36382

PEROXYACYL NITRATES
35927, 35977, 36198, 36230, 36362, 36369, 36370, 36382

PERSONNEL
35527, 35528, 35533, 36098, 36296, 36335, 36486, 36490, 36492, 36493, 36494, 36495, 36497, 36516

PESTICIDES
35538, 35947, 36316, 36480, 36499

PETER SPENCE PROCESS (CLAUS)
35572, 35616, 35643

PETROLEUM DISTRIBUTION
35727, 36433, 36435

PETROLEUM PRODUCTION
35474, 35755

PETROLEUM REFINING
35488, 35548, 35565, 35631, 35686, 35711, 35725, 35727, 35755, 36006, 36019, 36040, 36068, 36416

PH
35620, 36156, 36168, 36206, 36342, 36390, 36401

PHENOLS
35485, 35603, 35604, 35822, 36168

PHENYL COMPOUNDS
35473, 36123, 36168, 36180

PHENYLS
35473, 36123

PHILADELPHIA
36320

PHOSPHORESCENCE
36137

PHOSPHORIC ACID
35548, 35641, 35774

PHOSPHORUS COMPOUNDS
35641, 35774, 36113, 36178

PHOTOCHEMICAL REACTIONS
35458, 35480, 35500, 35679, 35704, 35859, 35952, 35959, 35972, 36011, 36025, 36033, 36041, 36047, 36052, 36060, 36066, 36067, 36068, 36087, 36098, 36121, 36130, 36132, 36137, 36148, 36149, 36152, 36157, 36160, 36171, 36174, 36184, 36198, 36212, 36217, 36370, 36486, 36508, 36515

PHOTOELECTRIC PHENOMENA
36139, 36142, 36151, 36157, 36174, 36213

PHOTOGRAPHIC METHODS
35546, 35869, 35902, 36346, 36376

PHOTOLYSIS
36130, 36132, 36148, 36157, 36160, 36217

PHOTOMETRIC METHODS
35813, 35816, 35829, 35858, 35859, 35889, 35898, 35916, 35919, 35921, 36171, 36207, 36509

PHOTOOXIDATION
35458, 36047, 36121, 36132, 36212

PHOTOSYNTHESIS
36376

PHTHALIC ACID
35885

PHYTOTOXICANTS
36054, 36345

PILOT PLANTS
35564, 35578, 35606, 35617, 35619, 35646, 35676, 35742, 35744, 35759, 35773, 35790

PINTO BEANS
36350

PITTSBURGH
35463

PLANNING AND ZONING
35478, 35498, 35527, 35535, 35600, 35686, 35706, 35712, 36097, 36111, 36348, 36425, 36442, 36443, 36455, 36456, 36483, 36500

PLANT DAMAGE
35469, 35525, 35532, 36033, 36304, 36306, 36330, 36346, 36348, 36350, 36351, 36354, 36355, 36356, 36357, 36360, 36362, 36363, 36364, 36365, 36369, 36370, 36372, 36373, 36374, 36377, 36378, 36379, 36380, 36381, 36382, 36384, 36385, 36421, 36490, 36492, 36509, 36511, 36515

PLANT GROWTH
36346, 36348, 36351, 36356, 36363, 36367, 36374, 36376, 36380

PLANT INDICATORS
35932, 35954, 36362, 36363, 36364, 36368, 36370, 36371, 36373, 36375, 36376, 36385

PLASTICS
35448, 35449, 35451, 35493, 35543, 35777, 36395

PLATING
36388, 36399

PLATINUM
35473, 36188, 36235

PLUME BEHAVIOR
35454, 36031, 36036, 36038, 36039, 36046, 36058, 36062, 36069, 36071, 36072, 36096, 36101, 36111, 36508

PNEUMOCONIOSIS
35502, 35845, 36223, 36241, 36244, 36245, 36249, 36259, 36262, 36280, 36289, 36313, 36322, 36341

PNEUMONIA
36275

POINT SOURCES
35462, 35476, 36019, 36023, 36040, 36055, 36082, 36095, 36106, 36108, 36506

POLAROGRAPHIC METHODS
35899

POLLEN COLLECTORS
36028

POLLENS
35538, 35830, 36028

POLYNUCLEAR COMPOUNDS
35495, 35702, 35860, 35978, 35983, 35989, 36016, 36018, 36167, 36180, 36222, 36256, 36282, 36294

POTASSIUM COMPOUNDS
35578, 35741, 36113, 36115, 36372

POTATOES
36351

POTENTIOMETRIC METHODS
35804, 35823, 35827, 35866, 35892, 35910, 35990

POULTRY
35499, 35518, 35956, 36334

POWER SOURCES
35440, 35454, 35457, 35466, 35472, 35503, 35507, 35514, 35517, 35519, 35529, 35539, 35545, 35552, 35553, 35554, 35556, 35557, 35558, 35567, 35570, 35588, 35589, 35591, 35609, 35610, 35611, 35618, 35621, 35625, 35626, 35628, 35642, 35650, 35665, 35666, 35670, 35682, 35683, 35686, 35687, 35690, 35694, 35700, 35703, 35709, 35730, 35733, 35735, 35737, 35740, 35743, 35746, 35748, 35749, 35754, 35756 35761, 35765, 35768, 35771, 35780, 35816, 35962, 36013, 36015, 36094, 36146, 36150, 36190, 36414, 36441, 36500

PRECIPITATION
36022, 36024, 36029, 36042, 36066, 36075, 36089, 36105, 36113, 36115, 36119, 36196, 36260, 36342, 36399, 36401, 36451

PRESSURE (ATMOSPHERIC)
35675, 36143, 36190, 36197, 36255, 36320

PRIMARY METALLURGICAL PROCESSING
35471, 35474, 35540, 35547, 35548, 35555, 35590, 35633, 35663, 35683, 35686, 35725, 35728, 35735, 35747, 35762, 35763, 35769, 35770, 35772, 35777, 35781, 35786, 35841, 35849, 35949, 35971, 36019, 36022, 36040, 36250, 36344, 36416, 36423, 36463

PRINTING
35966, 36479

PROCESS MODIFICATION
35440, 35446, 35468, 35483, 35485, 35496, 35514, 35515, 35564, 35574, 35579, 35580, 35585, 35590, 35591, 35599, 35603, 35605, 35619, 35645, 35649, 35663, 35672, 35683, 35691, 35697, 35710, 35720, 35723, 35737, 35738, 35740, 35746, 35752, 35753, 35761, 35764, 35777, 35781, 35785, 36150, 36153, 36169, 36462

PROPANES
35680, 35771, 35927, 36168, 36210

PROPELLER AIRCRAFT
36402

PROPENES
35777, 35927

PROPOSALS
35534, 36087, 36434, 36450, 36457, 36484

PROTECTIVE MASKS
35533

PROTEINS
36217, 36247, 36248, 36249, 36262, 36300, 36327, 36365, 36383

PUBLIC AFFAIRS
35522, 35531, 35532, 36006, 36102, 36270, 36413, 36415, 36443, 36463, 36466, 36469, 36479, 36491

PUBLIC INFORMATION
36469, 36479

PULMONARY EDEMA
36324

PULMONARY FUNCTION
36221, 36225, 36230, 36236, 36252, 36255, 36258, 36274, 36291, 36298, 36314

PULMONARY RESISTANCE
36258, 36274, 36298

PYRENES
35702, 35983, 35989, 36016, 36018, 36167, 36222, 36256, 36282, 36294

PYROLYSES
35446, 35564, 35622, 35710, 36124, 36180, 36210, 36214

Q

QUARTZ
36236, 36294, 36309, 36322

QUENCHING
36137, 36157

QUESTIONNAIRES
35728, 36501

R

RABBITS
36216, 36247, 36299, 36318, 36319

RADIATION MEASURING SYSTEMS
35878, 36171

RADIOACTIVE RADIATION
35756, 35798, 35800, 35814, 35848, 35861, 35863, 35867, 35881, 35894, 35914, 36020, 36066, 36111, 36166, 36179, 36199, 36234, 36253, 36279, 36314, 36484, 36513

RADIOACTIVE TRACERS
35800, 36114

RADIOGRAPHY
36259, 36313

RADIOLOGICAL HEALTH
36280, 36313

RADON
36020

RAGWEED
36028

RAIN
36029, 36113, 36115, 36119, 36399

RATS
36222, 36232, 36234, 36235, 36264, 36269, 36278, 36289, 36309, 36317, 36323, 36328, 36332

REACTION KINETICS
35449, 35496, 35558, 35563, 35572, 35584, 35622, 35627, 35704, 35711, 35729, 35750, 35768, 35788, 35895, 35928, 35939, 36053, 36088, 36124, 36130, 36134, 36136, 36137, 36146, 36147, 36149, 36155, 36160, 36161, 36169, 36170, 36173, 36174, 36175, 36183, 36184, 36186, 36188, 36189, 36191, 36208, 36209, 36212, 36213, 36214, 36233, 36262

REACTION MECHANISMS
35457, 35496, 35554, 35555, 35563, 35571, 35572, 35577, 35584, 35622, 35627, 35697, 35704, 35711, 35788, 35856, 35859, 35895, 35942, 36052, 36088, 36123, 36131, 36132, 36136, 36147, 36149, 36152, 36153, 36157, 36164, 36169, 36170, 36173, 36174, 36183, 36186, 36187, 36188, 36189, 36192, 36194, 36205, 36206, 36208, 36209, 36212, 36217, 36233, 36383, 36509

RECORDING METHODS
35546, 35759, 35853, 35869, 35887, 35902, 35913, 35939, 36037, 36346, 36376, 36451

RECREATION AREAS
35985, 36456

REDUCTION
35571, 35577, 35657, 35691, 35939, 36170

REFRACTIVE INDEX
35924, 36039, 36050, 36091, 36116

REGULATIONS
35453, 35461, 35502, 35519, 35532, 35755, 35811, 35949, 36010, 36178, 36307, 36407, 36416, 36426, 36427, 36433, 36435, 36437, 36439, 36443, 36445, 36450, 36454, 36464, 36466, 36468, 36477

RENDERING
35548, 36006

REPRODUCTION
36022, 36316

RESEARCH INSTITUTES
36009, 36409

RESEARCH METHODOLOGIES
35447, 35449, 35832, 35857, 36005, 36209, 36333, 36408, 36488

RESEARCH PROGRAMS
35441, 35534, 35543, 35645, 35695, 35729, 35752, 36009, 36087, 36237, 36395, 36409, 36432, 36481, 36487, 36490, 36498, 36509

RESIDENTIAL AREAS
35964, 35979, 36009, 36305, 36371, 36425, 36456, 36500

RESIDUAL OILS
35585, 35618, 35631, 35656, 35668, 35686, 35692, 35695, 35755, 35981, 36406

RESPIRATORY DISEASES
35502, 35845, 36222, 36223, 36241, 36244, 36245, 36249, 36253, 36255, 36256, 36259, 36262, 36266, 36269, 36272, 36273, 36275, 36277, 36280, 36281, 36285, 36287, 36289, 36296, 36297, 36302, 36305, 36311, 36313, 36314, 36320, 36322, 36324, 36325, 36328, 36330, 36340, 36341, 36508, 36515

RESPIRATORY SYSTEM
36222, 36241, 36244, 36245, 36249, 36256, 36257, 36259, 36261, 36263, 36264, 36266, 36272, 36276, 36280, 36293, 36294, 36298, 36299, 36303, 36305, 36309, 36310, 36311, 36312, 36313, 36317, 36319, 36322, 36324, 36325, 36328, 36332, 36340, 36341

RETENTION
35491, 36218, 36228, 36229, 36231, 36232, 36235, 36261, 36276, 36278, 36294, 36309, 36310, 36311, 36314, 36317, 36325, 36331, 36339, 36343, 36344, 36349, 36352, 36354, 36359, 36371, 36381, 36387

RINGELMANN CHART
35934

RIVERS
36113

ROTARY PISTON ENGINES
35567, 35768

RUBBER
35481, 35777

S

SAFETY EQUIPMENT
35533, 35899

SALTZMAN METHOD
35623, 35827, 35859, 35893, 35918, 35930, 35935

SAMPLERS
35447, 35479, 35624, 35659, 35677, 35799, 35801, 35810, 35813, 35814, 35818, 35819, 35820, 35824, 35828, 35830, 35837, 35841, 35842, 35844, 35847, 35852, 35853, 35854, 35860, 35864, 35870, 35873, 35883, 35884, 35897, 35899, 35906, 35914, 35922, 35932, 35933, 35935, 35938, 35945, 35953, 35954, 35980, 35995, 36028, 36129

SAMPLING PROBES
35466, 35828, 35837, 35843, 35850, 35901, 35933, 35945

SAN FRANCISCO
35995

SAPPORO
35498, 35949

SCANDINAVIA
35507, 35551, 35634, 35635, 35644, 35795, 35880, 35918, 35921, 36013, 36020, 36044, 36319

SCATTERING (ATMOSPHERIC)
35817, 35878, 35905, 35936, 36034, 36035, 36039, 36050, 36057, 36078, 36090, 36091, 36109, 36112, 36116, 36135

SCRAP YARDS
35769

SCREEN FILTERS
35682, 35758

SCRUBBERS
35452, 35487, 35560, 35576, 35583, 35597, 35605, 35608, 35609, 35614, 35615, 35617, 35620, 35627, 35629, 35633, 35634, 35636, 35639, 35653, 35655, 35658, 35664, 35667, 35679, 35688, 35690, 35693, 35705, 35706, 35716, 35724, 35741, 35744, 35745, 35747, 35753, 35759, 35763, 35769, 35770, 35777, 35778, 35783, 35788, 35790, 35791, 35792, 35793, 35794, 36405, 36479

SEA BREEZE
35971, 36028, 36059, 36064, 36073, 36077, 36085

SEA SALTS
35801, 35953, 36017, 36029, 36371, 36394, 36399

SECONDARY AIR
35683, 35785

SEDIMENTATION
35512, 35598, 35629, 35630, 35637, 35720, 35853, 35870, 35911, 36196

SETTLING CHAMBERS
35629

SETTLING PARTICLES
35442, 35457, 35459, 35467, 35470, 35471, 35472, 35475, 35490, 35498, 35501, 35502, 35504, 35511, 35514, 35518, 35526, 35531, 35538, 35541, 35566, 35574, 35585, 35595, 35596, 35597, 35598, 35602, 35608, 35624, 35629, 35633, 35634, 35637, 35639, 35640, 35649, 35652, 35655, 35661, 35666, 35669, 35698, 35702, 35703, 35705, 35714, 35720, 35724, 35736, 35755, 35758, 35767, 35778,

35783, 35786, 35787, 35801, 35845, 35846,
35847, 35849, 35853, 35854, 35858, 35862,
35868, 35873, 35887, 35914, 35922, 35928,
35953, 35955, 35957, 35958, 35960, 35963,
35965, 35967, 35968, 35969, 35975, 35976,
35979, 35983, 35984, 35989, 35990, 35996,
35997, 36001, 36003, 36004, 36009, 36010,
36011, 36012, 36014, 36017, 36029, 36042,
36051, 36056, 36064, 36082, 36090, 36094,
36105, 36111, 36117, 36175, 36199, 36226,
36236, 36244, 36245, 36262, 36267, 36270,
36276, 36289, 36294, 36301, 36303, 36304,
36310, 36312, 36317, 36322, 36328, 36337,
36341, 36347, 36354, 36371, 36375, 36377,
36392, 36393, 36394, 36399, 36401, 36402,
36459, 36462, 36479, 36509

SEWAGE
35499, 35506, 35523, 35561, 36006

SEWAGE TREATMENT
35499, 35506, 35561

SHIPS
36303

SILICATES
35583, 36328

SILICON COMPOUNDS
35583, 35848, 36328

SILICON DIOXIDE
35512, 36249, 36262, 36317, 36402

SILICOSIS
35502, 35845, 36244, 36249, 36262, 36322

SILVER COMPOUNDS
35601, 35973, 36031, 36326

SILVER IODIDE
36031, 36326

SIMULATION
35464, 35529, 35557, 35734, 35810, 35835,
35924, 36024, 36042, 36044, 36045, 36062,
36068, 36082, 36087, 36122, 36144, 36195,
36338, 36509

SINTERING
35562, 35655, 35683

SKIN
36232, 36318, 36324

SLAUGHTERHOUSES
35499

SMOG
35461, 35480, 35500, 35712, 35718, 35833,
35848, 35948, 35959, 35965, 35976, 35986,
36011, 36033, 36041, 36058, 36060, 36071,
36083, 36086, 36283, 36288, 36290, 36305,
36306, 36360, 36362, 36369, 36372, 36373,
36457, 36471, 36508, 36515

SMOKE SHADE
35516, 35934, 35946, 35950, 35957, 36039,
36111, 36285

SMOKEMETERS
35454, 35486, 35833, 35934

SMOKES
35440, 35445, 35448, 35449, 35453, 35454,
35471, 35486, 35489, 35511, 35516, 35519,
35539, 35540, 35559, 35603, 35621, 35640,
35666, 35680, 35693, 35694, 35703, 35737,
35746, 35762, 35763, 35765, 35868, 35902,
35934, 35940, 35949, 35951, 35957, 35965,
35968, 36018, 36039, 36071, 36072, 36190,
36223, 36237, 36255, 36266, 36274, 36421

SMOKING
35940, 35993, 3623 36240, 36281, 36295

SNOW
36029, 36075, 36115

SOAP MANUFACTURING
35548, 35745

SOCIAL ATTITUDES
36340, 36491, 36501, 36503

SOCIO-ECONOMIC FACTORS
35535, 36238, 36307, 36404, 36407, 36408,
36409, 36410, 36411, 36432, 36484, 36487,
36501, 36502, 36503, 36504, 36516

SODIUM COMPOUNDS
35466, 35562, 35672, 35745, 35803, 35848,
36033, 36113, 36115, 36371

SODIUM HYDROXIDE
35672

SOILING
36390

SOILING INDEX
35837, 35957

SOILS
35443, 35455, 35495, 35526, 35538, 35587,
35600, 35736, 36010, 36029, 36143, 36284,
36347, 36349, 36354, 36371, 36375, 36378,
36402

SOLAR RADIATION
35878, 35985, 36035, 36050, 36053, 36067,
36078, 36086, 36101, 36171, 36202

SOLID WASTE DISPOSAL
35443, 35446, 35453, 35458, 35475, 35479,
35499, 35504, 35523, 35537, 35542, 35543,
35548, 35561, 35564, 35573, 35603, 35646,
35655, 35688, 35710, 35714, 35725, 35739,
35750, 35762, 35769, 35785, 36019, 36407,
36453, 36480

SOLVENTS
35458, 35485, 35540, 35581, 35699, 35938,
36228, 36229, 36433

SOOT
35457, 35511, 35608, 35649, 35666, 35702,
35703, 35965, 36276, 36462

SOURCE SAMPLING
35529, 35728, 35811, 35828, 35829, 35868,
35909, 35919, 35933, 35934, 36049, 36493,
36494

SOUTH CAROLINA
36444

SOYBEANS
36345

SO2 REMOVAL (COMBUSTION PRODUCTS)
35450, 35474, 35563, 35568, 35572, 35574,
35578, 35579, 35580, 35616, 35617, 35618,
35620, 35623, 35631, 35636, 35638, 35639,
35643, 35644, 35645, 35653, 35655, 35660,
35662, 35672, 35686, 35689, 35695, 35712,
35715, 35721, 35726, 35737, 35741, 35742,
35744, 35747, 35750, 35753, 35759, 35766,
35782, 35789, 35790, 35791, 35792, 35793,
35794, 35884, 36186, 36413, 36462, 36479

SPACECRAFT ATMOSPHERES
36155

SPARK IGNITION ENGINES
35440, 35553, 35554, 35556, 35557, 35558,
35567, 35625, 35626, 35665, 35700, 35740,
35743, 35748, 35749, 35771, 36013, 36146

SPARK TIMING
35570, 35588, 35625, 35632, 35665, 35723,
35740, 35743, 35765, 36133

SPECTROMETRY
35443, 35466, 35473, 35486, 35495, 35537,
35551, 35759, 35802, 35805, 35806, 35808,
35827, 35829, 35831, 35853, 35855, 35867,
35876, 35900, 35907, 35909, 35914, 35920,
35925, 35927, 35931, 36109, 36139, 36142,
36148, 36165, 36166, 36174, 36177, 36202,
36227, 36257, 36346, 36509

SPECTROPHOTOMETRY
35443, 35506, 35542, 35797, 35819, 35828,
35854, 35860, 35874, 35879, 35882, 35886,
35904, 35945, 35973, 36137, 36157, 36178,
36233, 36265, 36271, 36301

SPINACH
36372

SPORES
35447, 35830

SPRAY TOWERS
35608, 35679

SPRAYS
35566, 35640

ST LOUIS
36021, 36106, 36464

STABILITY (ATMOSPHERIC)
35467, 35480, 35800, 36021, 36024, 36026,
36028, 36036, 36038, 36041, 36042, 36044,
36046, 36048, 36059, 36064, 36071, 36077,
36083, 36089, 36094, 36096, 36097, 36099,
36101, 36103, 36106, 36108, 36133, 36320,
36330, 36511

STACK GASES
35442, 35446, 35450, 35452, 35455, 35458,
35459, 35467, 35469, 35471, 35474, 35477,
35478, 35481, 35485, 35488, 35494, 35495,
35496, 35500, 35501, 35504, 35511, 35514,
35515, 35516, 35531, 35532, 35537, 35543,
35551, 35555, 35559, 35560, 35563, 35564,
35565, 35568, 35574, 35576, 35577, 35579,
35580, 35581, 35583, 35584, 35585, 35587,
35590, 35597, 35598, 35599, 35600, 35603,
35604, 35606, 35607, 35608, 35612, 35614,
35615, 35617, 35618, 35619, 35620, 35622,
35624, 35627, 35631, 35633, 35635, 35636,
35638, 35639, 35641, 35643, 35644, 35645,
35649, 35652, 35653, 35655, 35657, 35659,
35660, 35662, 35663, 35664, 35669, 35672,
35683, 35686, 35688, 35689, 35691, 35693,
35695, 35698, 35705, 35706, 35709, 35712,
35714, 35715, 35716, 35726, 35735, 35737,
35742, 35744, 35745, 35747, 35750, 35759,
35761, 35762, 35763, 35764, 35766, 35769,
35770, 35774, 35775, 35777, 35778, 35782,
35785, 35788, 35789, 35790, 35791, 35792,
35793, 35794, 35822, 35827, 35828, 35829,
35850, 35862, 35873, 35876, 35886, 35901,
35909, 35910, 35928, 35933, 35934, 35937,
35946, 35965, 35967, 35968, 35971, 35981,
36001, 36011, 36022, 36036, 36040, 36046,
36049, 36059, 36062, 36065, 36072, 36073,
36082, 36085, 36094, 36096, 36103, 36111,
36250, 36304, 36357, 36363, 36368, 36394,
36397, 36405, 36416, 36419, 36452, 36454,
36462, 36463, 36466, 36470, 36479, 36487,
36514, 36515

STACK SAMPLING
35828, 35829, 35868, 35909, 35933, 35934,
36049

STACKS
35476, 35498, 35638, 35645, 35686, 35709,
35712, 35755, 35762, 35786, 36036, 36040,
36046, 36061, 36065, 36070, 36072, 36096,
36111, 36419, 36479, 36506, 36514

STAGNATION
36064, 36089, 36097, 36320

STATE GOVERNMENTS
35811, 36433, 36434, 36435, 36436, 36439,
36442, 36444, 36445, 36446, 36447, 36448,
36449, 36450, 36457, 36475

STATISTICAL ANALYSES
35527, 35546, 35730, 35809, 35817, 35835, 35837, 35840, 35857, 35858, 35887, 35917, 35950, 35956, 35958, 35960, 35967, 35971, 35973, 35975, 35982, 35984, 35997, 36014, 36034, 36042, 36057, 36080, 36253, 36255, 36260, 36267, 36273, 36276, 36285, 36291, 36316, 36337, 36368, 36415, 36419, 36451, 36491, 36501, 36502, 36506

STEAM
35566

STEAM ENGINES
35539, 35567, 35733, 35771

STEAM PLANTS
35450, 35455, 35459, 35467, 35498, 35513, 35514, 35520, 35536, 35548, 35619, 35638, 35686, 35709, 35737, 35738, 35742, 35747, 35755, 35761, 35764, 35775, 35782, 35900, 35909, 36019, 36072, 36111, 36403, 36453, 36500

STEEL
35633, 35642, 35663, 35725, 35735, 35849, 35971, 36019, 36388, 36389, 36392, 36393, 36398, 36399, 36401, 36423

STILBENE
36180

STIPPLING
36384

STOMACH
36309

STONE
36289, 36396

STORAGE BATTERIES
35539

STRATIFIED CHARGE ENGINES
35567, 35730

STREETS
35492, 35495, 35546, 35974, 35993, 36010, 36013, 36043, 36176, 36268, 36284, 36511

STRONTIUM COMPOUNDS
36227

STYRENES
35473

SUBLIMATION
36120

SULFATES
35460, 35555, 35585, 35620, 35694, 35745, 35826, 35921, 35953, 35976, 35982, 36024, 36113, 36117, 36396, 36402

SULFIDES
35478, 35481, 35482, 35499, 35551, 35559, 35565, 35572, 35575, 35581, 35613, 35616, 35622, 35627, 35672, 35704, 35711, 35713, 35753, 35755, 35788, 35789, 35813, 35832, 35886, 35889, 35898, 35915, 35945, 35956, 36092, 36123, 36148, 36175, 36186, 36206, 36337, 36389, 36392, 36394, 36396, 36399

SULFITES
35555, 35568, 35790, 36248, 36300

SULFUR COMPOUNDS
35441, 35460, 35467, 35478, 35481, 35482, 35490, 35499, 35505, 35515, 35551, 35555, 35559, 35565, 35568, 35569, 35572, 35575, 35580, 35581, 35585, 35609, 35613, 35616, 35620, 35622, 35623, 35627, 35645, 35646, 35655, 35656, 35672, 35676, 35686, 35692, 35694, 35704, 35709, 35711, 35712, 35713, 35726, 35738, 35745, 35753, 35755, 35788, 35789, 35790, 35804, 35813, 35826, 35832, 35836, 35848, 35888, 35889, 35898, 35915, 35921, 35945, 35953, 35956, 35976, 35982, 36024, 36027, 36087, 36092, 36113, 36117, 36123, 36148, 36175, 36186, 36189, 36206, 36248, 36300, 36337, 36361, 36363, 36389, 36392, 36394, 36396, 36399, 36402, 36403, 36463, 36470, 36472, 36499

SULFUR DIOXIDE
35441, 35453, 35456, 35467, 35470, 35471, 35472, 35475, 35507, 35514, 35555, 35568, 35572, 35574, 35578, 35584, 35597, 35620, 35634, 35645, 35655, 35656, 35662, 35681, 35704, 35709, 35712, 35737, 35791, 35794, 35798, 35828, 35829, 35832, 35834, 35857, 35876, 35886, 35892, 35895, 35896, 35897, 35900, 35908, 35909, 35915, 35916, 35921, 35927, 35929, 35937, 35945, 35949, 35950, 35951, 35955, 35957, 35961, 35965, 35971, 35976, 35981, 35991, 36000, 36005, 36007, 36009, 36015, 36018, 36022, 36024, 36032, 36044, 36046, 36047, 36074, 36079, 36082, 36085, 36088, 36092, 36094, 36096, 36100, 36102, 36106, 36117, 36130, 36137, 36148, 36150, 36189, 36212, 36213, 36223, 36247, 36248, 36255, 36260, 36266, 36267, 36273, 36274, 36275, 36285, 36296, 36300, 36320, 36337, 36345, 36348, 36355, 36357, 36361, 36366, 36374, 36379, 36380, 36384, 36385, 36389, 36390, 36391, 36394, 36396, 36397, 36398, 36399, 36401, 36416, 36419, 36420, 36421, 36422, 36459, 36464, 36482, 36509

SULFUR OXIDES
35441, 35442, 35450, 35453, 35456, 35466, 35467, 35469, 35470, 35471, 35472, 35474, 35475, 35487, 35488, 35498, 35507, 35514, 35519, 35531, 35550, 35555, 35568, 35572, 35574, 35578, 35583, 35584, 35597, 35620, 35634, 35640, 35645, 35655, 35656, 35662, 35675, 35681, 35704, 35709, 35712, 35737, 35738, 35753, 35755, 35760, 35761, 35766, 35782, 35791, 35794, 35798, 35828, 35829, 35832, 35834, 35857, 35876, 35886, 35892, 35895, 35896, 35897, 35900, 35908, 35909, 35915, 35916, 35921, 35927, 35928, 35929, 35934, 35937, 35945, 35949, 35950, 35951, 35955, 35957, 35960, 35961, 35964, 35965, 35967, 35968, 35971, 35975, 35976, 35981, 35991, 35999, 36000, 36002, 36004, 36005, 36007, 36009, 36011, 36015, 36018, 36019, 36022, 36024, 36032, 36044, 36046, 36047, 36061, 36064, 36074, 36077, 36079, 36082, 36083, 36085, 36088, 36092, 36094, 36096, 36100, 36102, 36106, 36111, 36117, 36130, 36137, 36148, 36150, 36189, 36212, 36213, 36223, 36247, 36248, 36255, 36260, 36266, 36267, 36273, 36274, 36275, 36285, 36296, 36300, 36302, 36320, 36337, 36345, 36348, 36355, 36357, 36361, 36363, 36366, 36374, 36379, 36380, 36384, 36385, 36389, 36390, 36391, 36392, 36393, 36394, 36396, 36397, 36398, 36399, 36401, 36416, 36419, 36420, 36421, 36422, 36459, 36464, 36466, 36470, 36482, 36488, 36499, 36509

SULFUR OXIDES CONTROL
35441, 35450, 35474, 35514, 35561, 35563, 35568, 35572, 35574, 35578, 35579, 35580, 35582, 35616, 35617, 35618, 35620, 35623, 35631, 35636, 35638, 35639, 35643, 35644, 35645, 35653, 35655, 35656, 35660, 35662, 35668, 35672, 35676, 35686, 35689, 35692, 35695, 35711, 35712, 35715, 35721, 35724, 35726, 35737, 35738, 35741, 35742, 35744, 35747, 35750, 35753, 35759, 35766, 35773, 35782, 35789, 35790, 35791, 35792, 35793, 35794, 35884, 36166, 36181, 36186, 36403, 36406, 36413, 36462, 36479

SULFUR TRIOXIDE
35584, 35656, 35709, 35737, 35761, 35766, 35782, 35928, 35999, 36009, 36111, 36117, 36189, 36394, 36509

SULFURIC ACID
35548, 35622, 35667, 35839, 35852, 35888, 35953, 35960, 36015, 36024, 36088, 36159, 36389, 36397, 36416, 36509

SUPERCOOLING
36029

SUPERSATURATION
36029, 36118, 36120

SURFACE COATING OPERATIONS
35452, 35458, 35485, 35516, 35599, 35655, 35966, 36479

SURFACE COATINGS
35458, 35642, 35758, 36390, 36394, 36399, 36401

SURFACE PROPERTIES
35630, 35841, 35906, 36027, 36118, 36124, 36133, 36177, 36194, 36201

SURFACTANTS
35745

SURVEY METHODS
35527, 35528, 35844, 35902, 35932, 35950, 36005, 36009, 36238, 36315, 36346, 36429, 36451, 36458, 36465, 36476, 36482, 36483, 36488, 36493, 36494, 36496, 36500

SUSPENDED PARTICULATES
35440, 35445, 35448, 35449, 35453, 35454, 35455, 35461, 35465, 35471, 35480, 35486, 35489, 35500, 35501, 35511, 35514, 35515, 35516, 35519, 35531, 35538, 35539, 35540, 35559, 35560, 35562, 35574, 35576, 35584, 35592, 35601, 35603, 35608, 35615, 35621, 35640, 35666, 35680, 35684, 35685, 35693, 35694, 35703, 35712, 35718, 35737, 35742, 35746, 35762, 35763, 35765, 35769, 35770, 35777, 35778, 35782, 35786, 35830, 35833, 35839, 35841, 35847, 35848, 35852, 35853, 35854, 35860, 35861, 35863, 35868, 35870, 35882, 35888, 35902, 35906, 35934, 35940, 35948, 35949, 35951, 35954, 35957, 35958, 35959, 35960, 35961, 35964, 35965, 35968, 35969, 35973, 35976, 35980, 35981, 35982, 35983, 35986, 35988, 35990, 35992, 35997, 35998, 36000, 36002, 36003, 36004, 36005, 36007, 36008, 36009, 36011, 36018, 36028, 36033, 36039, 36041, 36047, 36056, 36058, 36060, 36063, 36071, 36072, 36083, 36086, 36118, 36119, 36120, 36126, 36128, 36145, 36162, 36190, 36211, 36223, 36237, 36255, 36266, 36273, 36274, 36283, 36288, 36290, 36296, 36305, 36306, 36320, 36360, 36362, 36369, 36372, 36373, 36392, 36394, 36403, 36416, 36421, 36450, 36457, 36471, 36488, 36508, 36511, 36515

SWEDEN
35551, 35634, 35635, 35644, 35795, 35880, 35918, 35921, 36020, 36319

SYNERGISM
35702, 35895, 36052, 36221, 36230, 36237, 36266, 36267, 36275, 36308, 36315, 36319, 36321, 36342, 36394, 36401

SYNTHETIC FIBERS
35493, 35777

SYNTHETIC RUBBER
35777

T

TAXATION
36410, 36468

TECHNICAL SOCIETIES
36498

TEFLON
35777

TEMPERATURE
35443, 35448, 35449, 35486, 35493, 35494, 35505, 35506, 35556, 35562, 35563, 35577, 35584, 35588, 35612, 35616, 35620, 35642,

35660, 35666, 35680, 35683, 35699, 35721, 35729, 35746, 35749, 35790, 35841, 35845, 35872, 35882, 35901, 35903, 35942, 36032, 36036, 36124, 36131, 36133, 36134, 36136, 36146, 36153, 36156, 36169, 36170, 36182, 36183, 36188, 36190, 36203, 36208, 36210, 36214, 36217, 36230

TEMPERATURE (ATMOSPHERIC)
36025, 36026, 36031, 36042, 36051, 36059, 36064, 36070, 36075, 36080, 36081, 36083, 36084, 36086, 36100, 36108, 36135, 36190, 36197, 36225, 36255, 36260, 36267, 36274, 36296, 36399

TEMPERATURE GRADIENT
35900, 36103

TENNESSEE
36445

TENSILE STRENGTH
36150

TEST ENGINES
35464, 35529, 35687, 35740

TETRAETHYL LEAD
36347, 36515

TEXAS
36019, 36250, 36433, 36434, 36435

TEXTILES
35493, 35777

THERMAL RADIATION
35446, 35513, 35554, 35635, 35756, 36026, 36080, 36270, 36407

THERMODYNAMICS
35553, 35554, 35556, 35557, 35558, 35563, 35572, 35721, 36145, 36162, 36201, 36203, 36206, 36210

THIN-LAYER CHROMATOGRAPHY
35851, 35860

THRESHOLDS
35795, 36221, 36242, 36251, 36256, 36284, 36299, 36326, 36355, 36420, 36421, 36509

TIMED FUEL INJECTION
35440, 35625, 35665, 35666, 35680, 35707, 35765

TIN COMPOUNDS
35769, 35973, 36008, 36227, 36331, 36371

TIP BURN
36381

TISSUE CULTURES
35941, 36226, 36282, 36297, 36299

TISSUES
36226, 36231, 36241, 36257, 36265, 36301, 36328, 36331

TITANIUM COMPOUNDS
35863, 35973, 36008, 36317, 36347

TOBACCO
35940, 36378, 36382

TOKYO
35471, 35480, 35510, 35531, 35581, 35683, 35848, 35967, 35972, 35977, 35983, 35990, 36000, 36004, 36005, 36033, 36060, 36074, 36084, 36293, 36296, 36305, 36370, 36393

TOLUENES
35603, 35859, 35938, 35994, 36005, 36228, 36229

TOPOGRAPHIC INTERACTIONS
35985, 36021, 36026, 36030, 36031, 36032, 36048, 36051, 36059, 36062, 36064, 36099, 36101, 36104, 36111, 36115, 36179, 36330, 36487, 36500, 36511, 36515

TOXIC TOLERANCES
36221, 36248, 36294, 36299, 36332, 36343, 36345, 36351, 36355, 36356, 36364, 36370, 36378, 36384, 36385, 36509

TOXICITY
35491, 35516, 35959, 36022, 36052, 36215, 36216, 36219, 36224, 36232, 36234, 36235, 36237, 36239, 36246, 36248, 36249, 36251, 36256, 36257, 36262, 36266, 36267, 36268, 36275, 36292, 36307, 36308, 36311, 36312, 36315, 36319, 36321, 36322, 36325, 36327, 36328, 36330, 36333, 36334, 36339, 36342, 36345, 36348, 36351, 36355, 36356, 36367, 36378, 36379, 36384, 36417, 36420, 36421, 36422, 36423, 36428, 36484, 36505, 36509, 36513, 36515

TRACE ANALYSES
35455, 35490, 35803, 35807, 35818, 35863, 35874, 35881, 35882, 35894, 35914, 35925, 35977, 35984, 36014, 36017, 36227, 36331

TRACERS
35836, 36028, 36058, 36062, 36069, 36070, 36071

TRACHEA
36245

TRAINS
35621, 36019

TRANSMISSOMETERS
35934

TRANSPORT
35645, 35836, 36023, 36027, 36028, 36031, 36032, 36044, 36053, 36054, 36055, 36056, 36058, 36059, 36066, 36068, 36073, 36079, 36084, 36085, 36087, 36089, 36092, 36097, 36098, 36105, 36117, 36135, 36179, 36309, 36310, 36317, 36338, 36440, 36509

TRAPPING (SAMPLING)
35884

TREATED FABRICS
35681, 35758, 35852, 35882, 35884, 35898

TREES
36028, 36343, 36344, 36355, 36356, 36357, 36361, 36363, 36365, 36373, 36375, 36376, 36377, 36379, 36380

TRUCKS
35454, 35472, 35621, 35736

TUBERCULOSIS
35502, 36322

TUMORS
36222, 36241, 36256, 36269, 36294, 36312, 36323, 36324, 36328

TUNNELS
35524, 35952

TURBIDIMETRY
35816, 35833, 35853, 35878, 35995, 36050, 36057, 36078, 36090, 36091, 36112

TURBULENCE (ATMOSPHERIC)
35650, 35800, 36021, 36032, 36048, 36066, 36084, 36098, 36101, 36108, 36122, 36135, 36138, 36143, 36207

TVA
35455

U

ULTRASONICS
35608, 35860, 36128

ULTRAVIOLET RADIATION
35480, 35960, 35972, 36047, 36053, 36171, 36175

ULTRAVIOLET SPECTROMETRY
35486, 35759, 35827, 35829

UNITED STATES
35458, 35522, 35530, 35535, 36008, 36395, 36412, 36420, 36429, 36489, 36502

UPPER ATMOSPHERE
36508

URBAN AREAS
35453, 35456, 35465, 35469, 35474, 35478, 35481, 35482, 35492, 35495, 35497, 35498, 35500, 35504, 35510, 35513, 35522, 35523, 35546, 35550, 35655, 35679, 35686, 35755, 35801, 35826, 35860, 35863, 35948, 35949, 35950, 35952, 35954, 35955, 35957, 35958, 35959, 35960, 35963, 35964, 35965, 35969, 35971, 35973, 35974, 35978, 35979, 35981, 35982, 35983, 35984, 35988, 35990, 35993, 35995, 35996, 35998, 35999, 36000, 36001, 36003, 36004, 36006, 36008, 36009, 36010, 36011, 36012, 36013, 36014, 36015, 36016, 36018, 36019, 36021, 36024, 36026, 36027, 36040, 36041, 36051, 36059, 36061, 36062, 36068, 36070, 36072, 36073, 36074, 36077, 36084, 36085, 36086, 36091, 36097, 36099, 36100, 36101, 36102, 36103, 36106, 36107, 36223, 36243, 36247, 36250, 36253, 36254, 36255, 36263, 36273, 36274, 36276, 36277, 36283, 36284, 36285, 36287, 36288, 36291, 36292, 36295, 36296, 36297, 36302, 36305, 36320, 36337, 36340, 36343, 36344, 36357, 36362, 36363, 36368, 36370, 36371, 36375, 36376, 36381, 36388, 36392, 36393, 36394, 36399, 36401, 36412, 36425, 36430, 36455, 36456, 36458, 36466, 36467, 36470, 36471, 36498, 36500, 36511

URINALYSES
36268, 36279, 36284, 36304, 36339

USSR
35468, 35505, 35541, 35592, 35606, 35677, 35702, 35745, 35766, 35774, 35799, 35851, 35891, 35895, 35928, 36034, 36105, 36115, 36129, 36148, 36163, 36164, 36173, 36176, 36177, 36180, 36183, 36200, 36202, 36203, 36205, 36209, 36232, 36242, 36244, 36246, 36251, 36259, 36395, 36420

V

VANADIUM COMPOUNDS
35490, 35766, 35803, 35958, 35973, 35982, 35984, 35990, 36008, 36009, 36299, 36371

VAPOR PRESSURE
35790

VAPOR RECOVERY SYSTEMS
35643, 35647, 35699, 35718, 35727, 36435

VAPORS
35511, 35542, 35566, 35576, 35680, 35817, 36093, 36118, 36145, 36205, 36208, 36339

VEGETABLES
36306, 36350, 36351, 36353, 36362, 36366, 36367, 36368, 36369, 36372, 36373, 36383

VENTILATION
35533, 35605, 35614, 35725, 35948, 35969, 35985

VENTILATION (PULMONARY)
36230, 36291

VENTURI SCRUBBERS
35560, 35614, 35653, 35655, 35679, 35744, 35763, 35783, 35790

VIRGINIA
35902, 36433, 36448

VIRUSES
36275, 36323

VISIBILITY
35837, 35852, 35951, 35995, 36039, 36091,
36202, 36420

VISIBLE RADIATION
36078

VOLATILITY
35551, 35703, 35731, 36052, 36164

VOLCANOES
35512, 36067, 36090, 36105

VOLTAGE
35661

VOLTMETERS
35586

W

WASHINGTON (STATE)
36436, 36450

WASHINGTON D C
36433, 36444

WASHOUT
36066, 36105, 36115, 36196, 36342, 36401

WATER
35441, 35566, 35601, 35640, 35740, 35783,
35794, 35817, 36118, 36119, 36126, 36159,
36168, 36208

WATER POLLUTION
35512, 35538, 35613, 35739, 36022, 36055,
36113, 36316, 36407

WEATHER FORECASTING
35936

WEATHER MAPS
36079

WEATHER MODIFICATION
36026, 36031, 36051, 36087, 36090, 36326,
36498, 36515

WEST AND GAEKE METHOD
35824, 35945

WETTING
35566, 35783

WIND TUNNELS
36042, 36048, 36111, 36144

WINDS
35500, 35510, 35538, 35755, 35905, 35949,
35952, 35954, 35971, 35972, 35980, 35985,
36017, 36021, 36028, 36032, 36036, 36037,
36039, 36040, 36042, 36043, 36044, 36054,
36056, 36057, 36058, 36059, 36060, 36062,
36063, 36064, 36071, 36073, 36074, 36076,
36077, 36079, 36080, 36081, 36083, 36084,
36085, 36086, 36089, 36096, 36097, 36098,
36099, 36100, 36101, 36102, 36103, 36104,
36105, 36106, 36114, 36144, 36179, 36255,
36260, 36330, 36368, 36373, 36425, 36511

WISCONSIN
36447

WOOD
35445, 35449, 35516, 35573, 35622, 35720

X

X-RAYS
35798, 35848, 35861, 35863, 35867, 35881,
35894, 35914, 36166, 36199, 36253, 36279

Y

YOKKAICHI
35755, 35982, 35984, 36293, 36374

YOKOHAMA
36011, 36291, 36306, 36362

Z

ZINC
35555, 35706, 36388, 36392, 36399, 36400

ZINC COMPOUNDS
35455, 35501, 35506, 35537, 35769, 35882,
35973, 35979, 35988, 35996, 36113, 36227,
36279, 36331, 36342, 36349, 36353, 36359,
36375

ZIRCONIUM COMPOUNDS
36177

AUTHOR INDEX

A

ABACHI K 35662
ABE K *36139, 36291
ABRAMOV R V *36105
ABURAMOTO Y 35663
ACKERMAN B *36021
ACKERMANN F H *35604
ADACHI F 35862
ADACHI M 36295
ADAMIAK ZIEMBA J *35822
ADAMS A B JR *35605
ADEDIPE N O 36367
ADRIAN D D 36023
ADROGUER B 36114
AIZAWA I 35998
AKIMOTO H *36121
AKIYAMA T 35958
AKLAND G G *36451
AKRIDGE J M 35785
ALANOVA T G *35606
ALEX W 35809
ALEXANDER F A JR *35607
ALLEN J E 36285
ALLET C 35800
ALLIGER H *35608, *35609
ALLSUP J R 35632
ALM A L *36424
ALTYNOVA M P 36259
AMANN C A *35610
AMAYA K *35823, *36033
AMBROSE P M *35789
AMBRUS J 36337
ANASTASSAKIS C E *35552
ANDERSON J M 36024
ANDERSON K T 35526
ANDERSON M 36249
ANDO A *35954
ANDREA J 36316
ANDREN A W 35455
ANDREYEV S D *36202
ANGUS J C 35943
ANTWEILER H *36308
AOKI M 36376
AOKI S 35662
AOKI T *35824, 35856, 35859
AOMURA K 35711
AOYAMA T 35499
APARICI P C *36239
APPEL B R *35825, *35826
ARAI M 35479, 36373
ARAKAWA H 35477, 35663
ARAKAWA T 35653
ARAKI S *35827
ARASHIDANI K 35495, 35860, 35983, 36167
ARKHIPOVA L N 35774
ARLYUK B I 35541
ARMSTRONG F E 35832
ARNOLD E 36316
ARNOLD O M *35560
ARONOW W S *36215, *36240
ASAI O 36283
ASAKUNO K 35977, 35983
ASHCROFT T *36241
ATWAL O S *36216
AUSTIN R H *36217
AXFORD A T 36252
AZUMA K 35627
AZUMA N 35964

B

BADAEV YU *36034
BAGWELL F A *35782
BAIKOV B K *36242
BAILEY B S *36140
BAILIE R C 35564
BALAZOVA G 35518
BALDECK C *35828
BALL G L *35451
BANDY A R 35902
BARBAKADZE L G 35541
BARBER D R 36134
BARIBAULT R P *35452
BARNARD J C *35611
BARRETT D F *35829
BARSDATE R J *35512
BARTHELEMY F *35955
BARTOLO A M *36452
BARTROP T H C *35453
BASCOM R C *35454
BASKAKOV A P *36203
BASS W 36316
BAUM E J *35612
BAUM H E *35613
BAUMANN H *36309
BAUMGARDNER R 35821
BAYES K D 36157
BAZAROV A P 35592
BEALL S E JR *35513
BEAMISH R J *36022, *36342
BEASLEY W H *36243
BEATTY G H 35837
BEBEE E M 36155, 36262
BECKER K W *35614
BEDE G *35514
BEESON K 36217
BELOBRAGINA G V *36244
BELT V W *35615
BELYAEV V A 36232
BELYAKOV YU M 36244
BENAIM C *35830
BENARIE M *36088
BENDHEIM P 36225
BENDIXEN T W *35561
BENEDETTI N L 35570
BENNETT G 36501
BENNETT H A *35616
BENSON H E 35793
BENSON J D 36141
BERG B V 36203
BERG N C 35507
BERGEAL M F 36247, 36248
BERGLUND B *35795
BERGMAN I *35899
BERGSTROM R W JR *36035
BERKSAN N A 36417
BERMAN P G 35894
BERRY W L 36387
BETHGE P O *35551
BHATIA S P *35617
BICKELHAUPT R E *35562
BIDLEMAN T F *35947
BIER H D 36137
BIERNAT S *36245
BIGLEY H A JR *36141
BILCZUK L 36292
BILLINGSLEY F P II *36142
BILLON A *35618
BIONDI A 35492
BIROT A *36114
BISAL F *36143
BISHOP J W 35689, 35742
BISHOP Y 36316
BITNER J L 36147, 36194
BLAKESLEE C E *35619
BLANKENSHIP C P *35729
BLOCK G 35950
BLOCK M 35629
BOEHME G *36191
BOETTNER E A 35451
BOGDAN L *35730
BOHN H L 35587
BOKINA A I *36246
BOLDUAN N 36230
BOLTON N E *35455
BOMPART G *36247, 36248
BOND W D *35731
BONOMETTI G *35900
BOONE J E *35620
BORTNER M H *35831
BOSSART C J *35796
BOURBON P 36247, *36248
BOURGEOIS S V JR *35563
BOURKE W L *35456
BOUX J F 35684, 35685
BRAIN J D *36218
BRENNAN E *36384
BRESSER H 36456
BRIATICO VANGOSA G 36313
BRICARD J 36159
BRINER W H 36234
BRINK J A JR *35922
BRINKMANN U 35815
BRISSON B *35621
BROADBENT D H *36453
BROCK J R 36336
BROCKHAUS A *36310
BROOKS A G F 36274
BROOME D *35457
BRUBAKER P E 36234
BRUCH J *36311, *36312, 36322
BRULEY A J *35622
BRUNN L M 35793
BRUNNER J A *36501
BRUSHWELL W *35458
BULLIN J A *36122
BURBAEV D SH 36383
BURGLUND U 35795
BURNETT R D *35533
BURRELL R *36249
BURTON R S III *35564
BUTLER C II 36262
BUTT P K *36214
BUXMANN J *35459
BYERS H R *36117, *36118, *36119, *36120

BYLINKINA YE S 35677

C

CABALLERO Y F 36016
CAILLE R 36065
CAIRNS R B *35534
CALDER K L *36106
CALDWELL B E 36345
CALVERT W R *35732
CAMBIAGHI G 36231
CARMICHAEL P J *36192
CARNOW B W *36250, 36260
CARNOW V 36250
CARR N L *35565
CARROLL H B JR *35832, *35833
CARTER J A 35455
CASSIDY A B *36036
CASTLEMAN A W JR *35460
CAVALLARO J A *35623
CAVIN O B 35881
CHAKROUN A 36151
CHAND R *35834
CHAPMAN K R 35867
CHEN C T 35997
CHENG L *35566
CHERNICHENKO I A *36251
CHIAPPINO G *36313
CHIBA S *35956
CHINZU M 35971
CHISAKA F 35704
CHIU W S 35454
CHIYO S 36363
CHOLAK J 36301
CHOVIN P 36012
CHRISTIE A A *35935
CHROSCIEL S *36425
CHUJO E 35474
CINQUEGRANE G J 35750
CIVITANO L *36037
CLARK T 35821
CLARKE P L *36123
CLEARY R W *36023
COCUDE M *36454
COFFIN D L 36299, *36330
COHEN N S *36124
COMFORT E H *35835
CONNOR J J 36371
COOK W G 35622
COOKE M J *35901
COOKE W E *36341
COOPER W E 36516
COPELAND G E *35902
CORBAT J P *35440
CORDNER M A *35733
CORMIS L D *36348
CORNETT J S 36179
CORRSIN S 36135
COSBY W T 35629
COTE E A 35836
COTES J E *36252
COUGHLIN L 36276
COURBON P *35624
COURT J D *35957
COX L F 35782
CRAIG D K *35923
CRAWFORD L W *35734
CRAWFORD R W 35930
CREASIA D A *36314
CRESCI R J *36144
CRIST H L 35828
CRISTEA G 36225
CROCKER W C 36278
CROKE E J *36107
CROKE K G 36107
CROSSLAND J *35567
CRUDGINGTON D R *36349
CSOM G 35514, *35735
CUDNICK R A *36193
CUETO J M *35625
CULLIS C F *36212
CULPEPPER M M *35736
CUMO M *36145
CUTLER A J B 35901
CUZZI SPADA R 36220
CZERMAK H *35761

D

DABBS J M 36252
DAESSLER H G *36455
DAHNEKE B E *35903
DALLAVALLE J M 35559
DAMS R 35803
DANESHYAR H *36146
DANJO A 35466
DARLEY P E 35952
DARTNELL P L *35626
DAVE J V *35924
DAVIDSON G A *36125
DAVIS D R 36378
DAVIS P M 35753
DAVIS W F *35904
DAYAN H *36126
DAYE R L *36089
DE GRAEVE J 35993
DE JONG D 36256
DE PENA R G 36130
DE SOETE G 35496
DE SOUZA L C 35617
DEAN C E *36378
DEAN K C *35762
DEARDORFF J W *36127
DEBIAS D A 36286
DEBRUN G *35737
DEHART A O 35768
DEHNEN W 36294
DEIRMENDJIAN D *36090
DEITZ V R *36147
DELANEY W E 36331
DELONG H P *35797
DENTON M B 35883, *36128
DENTON R *36338
DERHAM R L *35948
DERR R L 36124
DERR V E *35905, *35936
DESHPANDE J M *35798
DESTOMBES J L *36148
DEVOS A *36334
DEYANOVA YE V 35851
DIAMANT W *35515
DIBBS H P 35584
DICK R 35831
DIETZ R N *35836
DIETZ V R *36194
DIMITRIADES B 35701
DINGES H W *35925
DIXON R R *35738
DJOLOV G D *36108
DJURFORS S G *36038
DOBERSCHUETZ G *35783
DOBIAS J 36280
DOCHINGER L S *36379
DOCTOR R D *36502
DOI K *35627
DOLBEAR G E *35628
DOLE S H *35461
DOLGNER R *36315
DOMAL A G 35741
DORBES P 36247
DORMAN R G *35629
DOYENNETTE L 36151
DREYHAUPT F J *36456
DRINKWATER B L 36230
DUCE R A *36017
DUCSIK D W *35535
DUDLEY H C *35559
DUFFAUD J *36012
DUGDALE R C 35512
DUKLER A E 36122
DULCHINOS J 35913
DUNN H W 35455
DUNNING J W JR *35943
DUNTHORN D I 35675

E

EARL C B *35568
EASTERLING M *36457
EASTON J C *36405
EBARA R *36389
EBISAWA E 36077, 36375
ECOMARD A 35621
EDERER R 35742
EDGEWORTH L *35462
EDSON M H *35553, *35554
EGMOND N D V *36458
EGUCHI I *35958
EGUCHI T *36253, *36254
EHRENBORG L 35551
EHRLICH S 35689, 35742
EICHMEIER J 36020
EIDEN R *36116
EISENKLAM P 35629
EISENSTEIN L 36217
EKSLER N D 36246
EL YANOV V G 35799
EMERSON J D 35530
EMERSON P A *36255
EMERY J F 35455
EMI H *35630
EMMELOT P 36256
EMMERLING J E 35566
EN K 35484
ENDO R *35949
ENMEIJI K 35743
ENOKI R 35672
ENSOR D S *36039
EPSTEIN S S 36219, *36316
ERBA L 36231
ERNEST M V 35673
ETTINGER H J 36182
EVANS C E *35739
EVANS L S *36350
EVENDIJK J R *36018
EYLER J R 36206
EYZAT P 35621

F

FAIRCHILD G A 36275
FALVEY J M 36516
FARELLO G E 36145
FAVART M 36012
FAVORITE F G 36333
FEDOROVA V I 36289
FEDOSEYEV V A *36209
FEE G G *35926
FELDMAN C 35455
FERBER G J 35836
FERIN J *36317
FERON V J *36256
FERRARA R *36204
FERRARI G 36145
FERRARI L M *35959
FIELD J H *35793
FIELDS H H *35463

FILIMONOV V N 36177
FILIPPOV YU V 36183
FILONENKO M S 36259
FINE D H *36219
FINE L J 36236
FINNERAN J A *35631
FISHEL N A *35569
FISHER J F C *35555
FLACHSBART H 35903
FLEENOR J E 35804
FLEMING R D *35632
FLEMING R W 36124
FLUHARTY M C 35537
FODOR G G 35522, *36318
FOITZIK L *36109
FOKINA G V 35895
FOLZ J M *36459
FONTAN J 35800, 36114
FOPPIANO M *35633
FORNEY A J *35441
FORNEY A K *35464
FORNEY E J 35750
FORSMAN W C 36338
FORSTER E J 36140
FORTAK F *36040
FOSS E *35634
FOSTER J F *35837
FOURNIER E *36257
FRANCKOWIAK S 35618
FRANK R 36298
FRANZ R J *35570
FRASCA R L *35777
FRASER H S *35516
FRAUENFELDER H 36217
FREEDMAN R W 35944
FREEMAN A E 36323
FREISMUTH J S 35570
FREYSCHUSS S *35635
FRIBERG L *36319
FRIEDRICHS K H 36315
FROLOV E N 36383
FROLOV F YA 35592
FRUKHT I A *35799
FRYE E E *35636
FUCHS N A 36129
FUGAS M *35906
FUJIE K *35960
FUJIEDA Y 36368
FUJIHARA M *35465
FUJII T *35466, *35838, *35961, *36041, 36083, 36175
FUJIMURA T 35483
FUJISAKI K 35975
FUJIWARA M *36416
FUKAZAWA S *35740
FUKS N A *36205
FUKUDA K 36269
FUKUDA M *35839
FUKUOKA S 36000
FUKUOKA Y *36042
FUKUSHIMA H 35475, *35840, 36507
FUKUSHIMA M *36390
FUKUSHIMA Y *36258
FULKERSON W 35455
FULLER M J *35571
FULLER S P 35542
FUNAWATARI Y 35994
FUNESHIMA M 35977
FURAKAWA A 35482
FURUKAWA A 35481
FURUYA N 35639
FURUYA S 35973
FUSAMURA N *35637, *35841

G

GALLILY I 36126
GANDOIS S *35467
GARDNER D E 36299
GARRETT J W *35741
GARVIN D *36149, 36152, 36174
GASIOR S J 35441
GAUSS G 36322
GAVRILOV V V 35592
GEDGAUDAS M J *35550
GEORGE Z M *35572
GERSHKOVICH V L 35928
GIL G P *36505
GILBERT O L *36385
GILBERT T *36506
GILDEN R V 36323
GILES W H *36110
GILPIN A *36412, *36489, *36514, *36515
GINOCCHIO R *35638
GINSBURG T H *35763
GINZBURG E A *36259
GIRSH L S *36320
GITIS E B *35468
GIULIANI G *36406
GLEBOV V P *36150
GLENN R D 35742
GLINER J 36230
GO F *36043, 36082, 36470
GOEBEL K 35761
GOERKE H W 36417
GOIGNARD P *35726
GOKYO S *35639
GOLDSMITH A *35640
GOLDSTEIN B D *36220
GOLDSTEIN E *36221
GOLDSTEIN H W 35831
GOLDSTEIN I G *35950
GOLDWATER L J *36339
GONCHARENKO G K 35745
GOODRICH J K 36234
GOPALACHARI A S *35641
GORANSON S K 36451
GORDON J S *35742
GOTO M *35842
GOTO R 36057
GOTO T *36391
GOTSU I *35469
GOWENLOCK B G 36192
GOYER R A *36321
GRAAB J W 35904
GRANTHAM J B *35573
GRAVENGAARD P 36501
GRAVENHORST G 35801
GREEN G L 35486
GREENBERG M A *36260
GRENDA R N 35831
GRIGGS J H 36227
GRIMM D H 35733
GREIAFFE S J *35642
GROBMAN J *35517
GROENENDAAL W *35643
GROMOV B V 35774
GRONSKEI K E *36044
GROVER P L *36222
GROVES F R JR 35563
GRUNT J 36337
GRUSS K E *35518
GUEDALIA D *35800
GUEGUEN H *36151
GUNNING G D 35530
GUNSALUS I C 36217
GUSTAVSSON K A G *35644

H

HAEFELE E T *36503
HAENEL G *35801, *36091
HAEUISCH E *35794
HAGOPIAN M *35940
HAILSTONE R E *35784
HAINES J A *35645
HALEY F C *35802
HALISKY P M 36384
HALL A M 36252
HALL H J 35490
HALLIDY L A *36024
HALZL J 35735
HAM D O *36213
HAMMER H *36195
HAMMONS A S 36314
HAMPSON R 36174
HAMPSON R F *36152
HANIOKA N 36253, 36254
HANMER R W *36426
HANNODA N 35655
HANST P L *35927
HARA M 35963
HARADA Y 36283
HARDING C I *35945
HARDING L *35941
HARIO S *35646
HARRIS L A 35881
HARTOGENSIS F *36427
HASEGAWA T 35882
HASEMAN J K 36234
HASHIMOTO H 35655
HASHIMOTO M *36460
HASHIMOTO S 35662
HASHIMOTO T 36083
HASHIMOTO Y *35843, 35865, *35962
HASHIZUME T 35984
HATANAKA Y 35864
HATE J N *35545
HATTORI S 36324
HAYAKARI S 35971
HAYAKAWA K 35967
HAYAKAWA S 35982
HAYASHI E *35963
HAYASHI F 35999
HAYASHI H 35483
HAYASHI K 36295
HAYASHI O 35872
HAYASHI S 35963
HAYASHI [illegible] 35500
HAYE N R *35844
HAYES J V 36028
HAYNES W P 35441, 35793
HEALY T V *35951
HECKO I *36337
HEGGESTAD H E *36351
HEICKLEN J 36130
HEINDRYCKX R *35803
HEITNER K *35647, *35648
HENDERSON R D *35519
HENDRICKSON E R 35945
HENSON R M 36212
HEPPLESTON A G *36261
HERMAN B M 35878
HERMAN S P 36234
HERRON J T 36152
HIBBARD R R 35729
HICKS J E *35804
HIDY G M *36336
HIGASHINO I *35743, *35907
HIGAWA S 35474
HIGUCHI F 36291
HIJSZELER C *35764
HIKITA T *36153
HILSCHER W *36322

HIMEJI H 35655, *35964
HIMI K *35965
HIMI Y 35863, 35956, 36001
HINNERS R 36235
HINO M *36154
HIRAKI T 36002
HIRAOKA T 35655
HIROHISA S 35982
HIROO T 35977
HIROSE Y *35649
HIRSCHFELD T B *35805
HIRST E *36407
HISHIDA K *35470, *35471, *35472, *35966, *35967, *35968, *36507
HITCHCOCK D R *36092
HITOMI M 35907
HITOMI T 35864
HLUCHAN E 35518
HODGESON J A 35821
HOEGGER D *36461
HOEK G A L V *35536
HOEKSTRA I A *35908
HOENIG S A *35845, *36155, *36262
HOFFER E 35826
HOFFMAN A J *36019
HOFSTRA G 36367
HOLLNAGEL H S *35650
HOLMA B 36319
HOMMA K *35846
HONDA E *35969
HONMA H *36352
HONMA K 35843, *35847, 35865, *35970, 35989
HONMA S *36353, *36354
HONMA T *35848
HORAI T 36324
HORI M 35884
HORI N *36263
HORI T 35958
HORINO S *35574
HORIO H *35442
HORVATH S M 36230
HORVITZ J S *36428
HOSHIKA Y *35473
HOSOKAWA Y *35971
HOSONO Y 35477, 35663
HOUSER E A 35909
HOUSTON D B *36355
HOWE G M *36223
HOWELL R K 36345
HOWES J E JR 35837
HOWITT J S 35835
HRSAK J 35906
HRUBESH L W *35806
HUBBERT M K *35520
HUDSON J L *35575
HUEBNER R J *36323
HUERTAS M L *36093
HUETER F G *36417
HUFFMAN G L 35561
HUGHES F 35568
HUIE R E 36152
HULETT L D 35455
HUNTINGTON R L *35576
HURKAMP C H *35765
HWANG S H 36338

I

IBRAGIMOV F KH *35766
ICHIKAWA I *36264
IGARASHI N *35972
IHIDA M *35849
IIDA Y 35508, 35722
IIZAKA S 35986
IKEBE K *35651
IKEDA K 35472, 35967
IKEDA M *35652
IKEGAYA H *35653
ILLEI V 35514
ILTIS R 36278
IMAGAMI K *35850
IMAI M 35477, 35663
IMAI N 35976
IMAI S *35973
IMAI T 35972
IMAMURA K 35466, 36041
IMRIS P *35654
INABA H *35577
INADA Y 35478
INGEBO R D 35680
INGRAM W T *35946
INOUE K 35508, 35509, 35639, 35722, 35961
INOUE M 35854
INOUE S 35660
INOUE T *35474, *35655, 35886, 35974, *35974, *36462
INOUE Y 36297
IPATOVA S A *35851
ISBELL M W 36215
ISHIGAKI S *35656
ISHIGAKI Y 35964
ISHIGURO T *35475, 35840, 36507
ISHIHARA Y *35657
ISHII T 35849
ISHIKAWA Y 36043, *36045, 36082
ISHIMAMA S 35962
ISHIMARU K *36156
ISHINISHI N 36258, 36281
ISHIZAKA M 35478
ISHIZAKA N 35991
ITAKURA J *35975
ITAKURA Y 36062
ITO E 35499, 35979
ITO H 35715
ITO K 35740
ITO M 35481, 35482, 35504, *35976
ITO N 35977, 35982, 35984, 35994
ITO O 35639
ITO S 35976
ITO T 35655, 35869, 35964, 36287
IVANOVA E S 36259
IVLEV L S 36202
IWAMOTO T 35855
IWASAKI S 35483
IWASAKI T 35637, 35841
IWASAKI Y 35475, 35840, 36507
IWASE Y 35887
IZUMI S 35971
IZUMIKAWA S *35977

J

JACKS C 35938
JACQUOT R D *35909
JAMES K W *36046
JANSEN P *36094
JANSSON R E W 36207
JANTUNEN M 36013
JEFFREY G H 36100
JEFFREY R K *35937
JENSEN K F *36356
JOAO DA MADEIRA S 36339
JOHANSSON T B 35867
JOHNSON C A F 36192
JOHNSON E H 35575
JOHNSON G E 35441
JOHNSON H *35537
JOHNSON J H 35700
JOHNSON L D *35658
JOHNSTON W M 35765
JONAS C *35659
JONES A G 36017
JONES D D 36243
JONES I T N *36157
JONES P *36265
JONES P M S *36408
JORDAN S 36094
JOUAN M *36266
JUGEL W *35767
JUNOD A *35476

K

KAAIJK L *35910
KADOI M 36393
KADOWAKI S 35473, *35852
KADOYA N 35992, 36064
KAGA A 36085
KAGAWA H 35469
KAIHO Y *36392
KAISER R E *35807
KAJITANI S 35740
KAJIWARA M *36158
KALB G W 35828
KAMINO Y *35660
KAMIYA A 35499
KAMIYAMA H 35484
KANAMARU T 35984
KANASAKI T 35839
KANEKO F *36267
KANNARI T 35649
KANNO S 35956, 36001
KANNO Y 35980
KAPRALEK J *35661
KARADY P *35521
KARANDAKOVA I M 36251
KARASEK F W 35503
KARIMATA Y 36277
KASAHARA M *36047
KASAKA Y 35973
KASHIWAGI H 36277
KASTKA J *35522
KATAYAMA T 36063
KATO T *36357
KATSUNUMA H *36268
KATSUYAMA T 35854
KAWAI K *36269
KAWAKAMI W 35662
KAWAMURA K *35662
KAWANOBE H 36353
KAWASAKI G *35477, *35478, *35663
KAWASE Z *35479, 35501, 35705, 36373
KAY E *36343
KAZANSKIY V V 35895
KELLER T *36344
KELLEY C F *35664
KELLOFF G J 36323
KENNAWAY T *35792
KENNEDY A S 36107
KERANEN T W *35665
KERR C P *35744
KERTESZNE SARINGER M *35978
KHACHATURYAN M KH 36242
KHAN I M 35457, *35666
KHESINA A YA 35702
KIANG C S *36159
KILGREN K H 35713
KIM G 35673
KIMMEL H S *35443
KIMOTO T 35970
KIMURA K *35853, *36270
KIMURA M 35986
KIMURA T 36466
KINCH R J 36023
KINNEY J F *35785
KIRK A G II *36463
KIRSCH A A *36129

KISHORE K 36133
KITA H *36271
KITABAYASHI K *36048
KITAGAWA T *35480
KITAGAWA Y *35481, *35482
KITAMURA M 35975
KITASE M 35499, *35979
KITAYAMA H *35483
KITAZAWA Y 36283
KLECHKE E W 35642
KLEIN R 36234
KLODT D T *35667
KNOX B E 36331
KOBAYAKAWA T *35484
KOBAYASHI M 36057
KOBAYASHI S *35485
KOBAYASHI Y 35884, 35984
KOENIG H E *36516
KOGLIN B 35809
KOGURE N 35850
KOHGO T 35949
KOHL A L *35791
KOHN R E *36464
KOIKE K 35852
KOIKE S *35854
KOIZUMI I 35980
KOIZUMI M 35470, 35471
KOJIMA I 35852
KOLLAR K 35978
KOMABAYASHI R 36072
KOMAKI Y 35972
KOMEIJI T 36370, *36393
KOMURO T 36291
KONAWA Y 35497
KONO H 36290
KOPCZYNSKI S L 35952
KORNEJEVA M J 36259
KOSAKA A 35672
KOSAKA H 36002
KOSAKU A 36295
KOSART I *35786
KOUDA H 35715
KOYAMA T *35980, 36002
KOYAMA Y *35855
KOYANO M 35495, 35860, 36167
KOZARU K *35856
KRAEMER A *36224
KRAUSE S R *35486
KRETZSCHMAR J G *35857
KREUZER L B *35808
KRIGMAN M R 36234
KROCKTA H *35778
KUBO S 35975
KUBOTA M 35876
KUBOTA T 36271
KUELSKE S *36049
KUKHTITSKIY O L *35745
KUMAGAI K *36272
KUMAZAWA Y *35981, *36273, *36429
KUNTZ K W 36113
KURATA S 36462
KURATA Y 35876
KURE F 35961, 36045
KURIYAN J G *36050
KURODA H 35743
KUROSAWA K *35578, *35579, *35580
KURYLO M J 36152, *36160
KUSANO K *35581
KUWAHARA H *35668
KYAN C P *36430

L

LAAMANEN A *36013
LACROIX C 36065
LAHORI M M 36284
LAI L Y 36220
LANDOVITZ L 35950
LANDSBERG H E *36051
LANG H W *35944
LANGENSIEPEN H W 36195
LARDIT F *35669
LASTER L L *35487, *35488
LAURENCE K M 36252
LAWLESS T C 36451
LAWRIE W B 35629
LAWSON L J *35670
LAWTHER P M *36274
LEARNED R E 35549
LEBOWITZ M D *36225, *36275
LECH J 35819
LECH J F 35879
LEE A K K *35671
LEE G K 35937
LEE R K 35569
LEFEBVRE A H *35746
LEHMANN P 35476
LEISTER R J 35750
LENHARDT K 35925
LENTS J M JR 35734
LENZ W M 35643
LEONARD T R 35723
LEPAREUR L 35588
LESCHONSKI K *35809
LEVINA T A *35928
LEVITT B P 36214
LEVTONOVA E V 36259
LEVY G M 35831
LEVY P 36247, 36248
LEWIS C J *35747
LEWIS G P *36276
LIBBY P A *35489
LIBERTI A 36417
LICHT C *36495
LIDZEY R G 35935
LIEB D 36219
LIFSHITZ C *36161
LINDVALL T 35795
LINZON S N *36490
LIPPERT W 36221
LISICKY M *36358
LISOVSKAYA I L 36383
LITT M 36338
LITTLE A 35629
LITTLE C G 35936
LITTLE P *36359
LIU B Y H 35810
LIU L L 36387
LOEFFLER F *35911
LOHS K *36052
LONGHETTO A 36037
LONNEMAN W A *35952
LORD P W 36274
LORENZI L JR *35582
LOTZE J 35767
LUETZKE K *35858
LUI M K 36068
LUND L *36162
LUNIN J *35538
LURIA M *36130
LUSHNIKOV A A *36163
LUTKINS S G 36243
LYON W S JR 35455
LYUBOVTSEVA S 36034

M

MACBETH J W 35835
MACCRACKEN M C *36053
MACHI S 35662
MACKINNON D J *36131
MADELAINE G 35814
MAEDA H *35859
MAEDA K 35855
MAEDA Y 35824, 35856
MAGA J A *35539, 35995
MAGEE E M *35490
MAHADEVAN T N 35897
MAHAFFEY K R 36321
MAHONEY W P *35583
MAKI E R *35768
MAKI K *35672
MAKINO K 35877, 35985
MAKSIMOV B G *36164
MALANCHUK M 36278
MALET L M *36095
MALONEY C J *35912
MALSCHAERT F P *35491
MAMMARELLA L *35492
MAMURO T 35466, 35861, 35914, 35989, *36014
MANOWITZ B 35460
MAPPERLEY B W *35493
MARENCO A *36196
MARGOTTIN MACLOU M 36151
MARIER P *35584
MARKANT H P *35790
MARKLAND J 36349
MARKOVITZ D 36225
MARKUSCH H *36465
MARLIERE C 36148
MARPLE V A *35810
MARSHALL V P 36217
MARTY A M 36093
MARTYSHEVA L P 35606
MARUYA H 36253, 36254, 36302
MARZOCH D *36165
MASELLI J M *35673
MASHITA T 35715
MASON A A 35734
MASUDA N *35494
MASUDA S 35639
MASUDA T 36061
MASUMOTO I 36389
MATERNA J *36380
MATRAI I 35735
MATSUDA Y 35466, 36014
MATSUI T *35982
MATSUI Y 35444
MATSUMOTO F 35886, 35887
MATSUMOTO T 35696, 36297
MATSUMURA T 36004
MATSUMURA Y 36269
MATSUNAKA S 36364
MATSUNAMI T 35466, 36014
MATSUO S *35585, *35586
MATSUO Y 35882, *36166
MATSUOKA M 35843
MATSUOKA S *35748, *35749
MATSUOKA T 36287
MATSUOKA Y 35681, *36360, *36361, *36381
MATSUSHITA H 35485, *35983, *36167
MATSUSHITA S *35495, *35860
MATTY R E 35790
MATVEEV A A *36115
MAYBANK J *36054
MAYKOSKI R T *35938
MAYUSUMI T 35651
MCADAMS H T 35730
MCAULY K J 36190
MCCABE J M *36431
MCCALLA T M *35523
MCCARTHY J H JR *35549
MCCARTNEY H A 36078
MCCOMB G G 36110
MCCONNELL J C 36025
MCCREA D H *35750
MCELROY M B *36025

MCFARLANE H M 36405
MCGARRY M G *36432
MCIVER R T JR *36168, *36206
MCLLROY R A 35790
MEADOWS D L *36480
MEASURES R M *35929
MEDVEDEV L A 36244
MEGIT A 36243
MEIER H 36323
MEINERS B G 36301
MEISEN A 35616
MEJZR J *35674
MENARD T 36088
MENCHER S K 36036
MENNELL M *35779
MERKEZ F 36012
MERRIMAN J R *35675
MERRION D F 35486
MERTAUGH L J 36138
MERTENS P 35535
MESZAROS A *35953
MEUSCHKE J L 35549
MEYER C *35496
MIHASHI M 35986
MIKHEYEVA T YA 35606
MILLER A J 35513
MILLER C E 36338
MILLER K J *35676
MILLER L L 35526
MILLER S D *36226
MILLER V L *36345
MILLS M T *36055, *36056
MILOSERDOV P N 35745
MINAMI T 35596
MIRANDA H A JR *35913
MISIASZEK J 36225
MITA T 35986
MITO Y 35864
MIYABE H *35751
MIYAJI K *36277
MIYAMOTO I 35478
MIYAMOTO S *35587, 35600
MIYAMOTO T 36375
MIYAMURA N *35984
MIYANO T 35483
MIYAO S *35444
MIYASAKA A 36156
MIYATA K 35581
MIYAZAKI M 36003
MIYAZAKI N 36281
MIYAZAKI S 35980
MIZOGUCHI I 35877, *35985
MIZOGUCHI T *35497
MIZOHATA A 35466, *35861, *35914, 36014
MIZOHATA T 35483
MIZUKAMI K 35501, 35705
MIZUKAMI Y *35498
MIZUNO K 35892
MIZUTANI H *35499
MIZUTANI N 35655
MOCHIZUKI M 36169, 36170
MOENIG F J 35903
MOHLER J B *36388
MOHNEN V A 36159, *36208
MOORE D J *36096
MOORE M 36235
MOORE W JR *36278
MOREL M *35588
MORGES W 36329
MORI G 36154
MORI H 36377
MORI O *35862
MORIGUCHI M 36069
MORIKAWA M 36360
MORIMURA K 35485
MORITA K 35966
MORITA S 35743
MORITANI A 35504
MORLIN Z 35978
MORRIS W E 36140
MOSS O R 36182
MOTINA G L *35677
MOTOMIYA T 36295
MOYERS J L 35883
MUELLER F *35678
MUELLER P K 35995
MUHR W 35911
MUKAIDA T 35991, 35992, 36064, 36283
MULAC J C 36198
MULAY L I *36331
MUNEMORI M 35824, 35856, 35859
MUNKELWITZ H R 35460
MURAI K *36057
MURAMATSU F *35863
MURANAKA H 35655
MURAOKA I 35501, 35705
MURASE A 35886, 35887
MURATA M 35748, 35982, 35984
MURAYAMA H 35483
MURAYAMA T 35740
MURIAS B S F *36418
MUROYA H 36271
MURPHY J R 35631
MURRAY F E *35788
MUSKIE E S *36413
MUTSUURA T *36362
MUTUSKIN A A 36383
MYKOLENKO P 35589

N

NABETANI M 35694
NADER J S *35811
NAGAMINE S 35593
NAGASAKI M *35864
NAGATA K 35470, 35471, *36169, *36170
NAGAYA T 35848
NAGAYAMA K 36253, 36254
NAGEY T F *35589
NAGOYA T 35841
NAITO K *36058
NAITO M 35497
NAKADOI T 35838, *36171
NAKAGAWA C 35975
NAKAI K *35986
NAKAI T 35655
NAKAJIMA C *36059
NAKAJIMA T *36324
NAKAMURA A *36363
NAKAMURA H *36364, 36369
NAKAMURA K 35506, 35843, *35865, 35875, 35987, 35994, *36060
NAKAMURA M 36002
NAKANISHI K 35655
NAKANISHI M 36400
NAKANO H 35974
NAKANO K 35843, *36132
NAKANO M *35500, *36061
NAKANO T 35500, 36061
NAKANO Y *35987
NAKAO S 35471, *35866, 35966
NAKASHIMA Y 36273
NAKATANI K *36279, 36352, 36353
NAKAYAMA M *36172, *36394
NAKAZAWA Y *35988, 35996
NAND S *35812
NASU Y 35954
NATUSCH D F S 35575, *35813
NAVRATIL M *36280
NAYLOR M E 35589
NEILL G 35535
NELSON A W JR *35780
NELSON J W *35867
NELSON K E 36260
NEMIROV G V 35895
NESTERENKOI V B *36173
NETTESHEIM P 36314
NEWHALL H K *35556
NEWICK P 36409
NICKLESS G 36265
NICOLAU A 36339
NIEDERMEIER W *36227
NIHEI H 35470, 35471, 35472, 35966, 35967, 36507
NISHI R 35466
NISHIDA K *35524, *35546, *35679, 35964, *36062, *36395
NISHIDA M *36466
NISHIJIMA T 35855, 36466
NISHIKAWA Y 35961
NISHIMURA Y 35672
NISHIYAMA K 35627, 35655
NIX T B *35590
NOBUTOMO K 36258, *36281
NOMINE M 36015
NOMIYAMA H 36228, 36229
NOMIYAMA K *36228, *36229
NOMOTO H 35497
NOMURA T 35743
NONAT A 36088
NONHEBEL G *36111
NORGREN C T *35680
NOUCHI I *36365, *36366, 36370
NOVAK J *35915
NOVAKOV T N 35826
NOVIKOV A A 35774
NOWICKI M 36425
NOZAKI K 36269
NOZAKI T 36375
NUMAKAWA M 35893
NUNOKAWA T 35958

O

O MARA M M *35445
OBRIKAT H *36282
OCHIAI S 35991, 35992, 36064, 36283
ODA K 35974
ODA M 36291
ODAIRA T 35475, 35508, 35509, 35722, 35977, 35983, 36000, 36365, 36366, 36370, 36393
ODELL F G *35525
OGAWA T 35484
OGDEN E C 36028
OGI K *35868
OGIHARA A 36291
OGLE J C 35881
OGUMA H 36253, 36254
OHASHI T 36062, 36365, 36370
OHMAN H L *35526, 36402
OHMOTO S *36346
OHTA S *35869
OIKAWA K 35843, 35970, *35989
OITA K 35655
OIWA T 35892
OKA K 35961
OKA M 35839
OKABE H 36152, *36174
OKABE T 36346
OKAMOTO M *36063, 36083
OKAMOTO S I 36074
OKANO A 35843
OKITA T *35870, *35871, *36175, *36508
OKUMURA H 35478
OKUNO T 35889
OKUYAMA K 35630
OLNEY C E 35947
OLSON J S 36056

OLSON L W 36187
OLSZYNA K J 36130
OMICHI S *35681, *35990, 36360, 36400
OMOTO Y 35876
ONIMURA K 36397
ONITSUKA S 35660
ONOZUKA H 35475, 35840
OOTAKI A 36074
OPIE W R *35769
OPPENEAU J C *36509
ORLOV G P 36244
ORLOVA YE I 35745
ORMROD D P *36367
ORNING A A 36181
OSADA Y 36003
OSAKA H 35485
OSAWA M 35985
OSAWA N 35877
OSGERBY T 35741
OSHIMA T *35872
OSHINA T *36368
OSHIO T 36043, 36045, 36082
OTA Y *36369, 36372
OTTEVANGER W P A G 36075
OTTOFY F B *35682
OYA F *35991, *35992, *36064, *36283
OYA M *35683
OYAMA G 36156
OZAKI K 36288
OZAWA E 35843

P

PADD R J 35454
PADET J P *36065
PADRE R 36285
PAFFRATH D *36481
PALAZZI G 36145
PALLAND C L 36080
PANCHENKOV G M 35766
PAPETTI R A 35461
PARTSEF D P *36176
PARUNGO F P 36027
PASHLEY J H 35675
PATERSON M P *36482
PATTERSON D J *35557
PENNACHETTI J T *35684, *35685
PENNER J E 36025
PERNA A 35443
PERRAULT R E 36199
PETERS J M 36236
PETERSON D W 35723
PETERSON G 35948
PETERSON J T *36026
PETROLL J 35787
PETROVICH V YU 36173
PETRYANOV I V 35592
PETTITT B C *35942
PHELINE J *35686
PHILLIPS D H 36050
PICH J 35820
PILAT M J 36039
PINKERTON J D *35591
PIRSH E A 35782
POCHASHEV E N 36244
POIREL J *36015
POLI A A 35796
PORTHOUSE J D 35922
POSTMA N D *35687
POTT F 36294
POTTER G M *35770
POZDNYAKOV D V *36177
PRAHACS S 35617
PREUSS P W *36386
PRICE P J 36323
PSHENOVA K V 36383
PUECH M 36093
PUESCHEL R F *36027
PURCHAS D B 35629
PURDOM P W *36491

Q

QAZI Q 36285
QUARLES J *36178, *36414, *36433, *36434, *36435, *36436, *36437, *36438, *36439, *36467, *36468, *36469
QUITTER V *35787

R

RAASK E 35901
RADFORD D W F 35935
RAGOT J P *36396
RAILLERE R *35916
RAKO J 35978
RAMAZZOTO L J *36332
RAMPRASAD G *36284
RANDERS J 36480
RANDERSON D *36179
RANZIERI A J *35527
RAO M *36285
RAPPAPORT L J 36332
RASTOGI R P *36133
RASTYANNIKOV YE G 35891
RAVEN P B *36230
RAY R M 35832, 35833
RAYNOR G S *36028
READ R G *36097
REAGAN J A 35878
REEVES M 36055
REILLY B B *35688
REININK F 35687
REITER E R *36066, *36067
RENOUX A *35814
REPENKOVA T G 35774
REVICH B A 36176
REYNOLDS S D 36068
RHIM J S 36323
RHODES R P 35741
RICHARDSON W C *36210
RIEDIGER G *35917
RIESENFELD F C 35791
RIGDON L P *35930
RIGGS R K *35873
RIVERS J 36162
ROBENS E 36191
ROBERTS P J *36068
ROBINOVICH L M 35606
ROBINSON E B *35689
ROBINSON J W *35874
ROCKWELL H B *35690
RODIN V I 35774
RODYGINA L G *36180
ROESSLER F *36112
ROLLE W 36052
ROMANOV V M 36259
RONDIA D *35993
ROSEN G *35446
ROSENBLUM B F 36250
ROSENFELD L M *36286
ROSENSON R *35540
ROSINSKI J *36029
ROSLINSKI L M 36333
ROSS R A 35622
ROSS R D *35691
ROTH P M 36068
ROTHE K W *35815
ROUBERT H 35467
ROUSH M L 35894
ROVESTI W C *35692
ROY R 36331
ROYER G W 36182
RUDEY R A *35752
RUFEH F 36219
RUHLING R O 36230
RUIZ R A *35693
RUS HUGI U 35759
RYDER R R *36496
RYLANDER R 36319
RYOKEN H 35481, 35482

S

SABERSKY R H 35948
SADILOV P V 36203
SADOVSKII B F *35592
SAIKI Y 35956, 36001
SAITE H 35639
SAITO K 35704
SAITO N 35504
SAITO T 35472, *35694
SAITO Y 35999
SAJUS L *35695
SAKAE Y *36397
SAKAI T *35696, 35979
SAKAMOTO A 35854
SAKATA M *35875, *35994
SAKO S *36470
SAKURABA S *36069
SAKURAI S 35998
SALLEE J M *35697
SAMOILOVICH V G 36183
SAMUELS H J *35995
SANCHEZ FERNANDEZ MURIAS 36016
SAND P H *36440
SANGUIGNO N *36325
SANNOMIYA S *36287
SANO U 35470, 35471, 35967
SANTI A L 35492
SANYAL B 36398
SARKAR M K 35812
SARUTA E 36272
SASAKI K *35593, 35651
SASAKI Y *35876
SASS S *35753
SATHWARA N G 36284
SATO C 35890
SATO H *35877
SATO J *36070
SATO K 36073
SATO N 36061
SATO R 36279, 36352, 36353
SATO S 35893
SATO T 35988, *35996, 36272
SATO Y 35985
SATSUTANI T *36471
SAVITZ C W 36155
SAWADA M 35975
SAWADA T 35466, 36366, *36370, 36393
SAWANAKA K 36374
SCHALTENBRAND E D *35698
SCHEER M D 36152
SCHIKARSKI W 36094
SCHMIDT U *35816, *35939
SCHNEIDER P *35699
SCHOLZ P D *36134
SCHOTLAND R M *35817
SCHROEDER M 35794
SCHULTE J *36335
SCHURING D J 35730
SCHWAB G 35459
SCHWARZER N 35903
SCHWEIKERT J F *35700
SCORER R S 36482
SCOTT A K 35742
SCOTT D S 36125

SEBAYASHI T *36288
SECCHI G C *36231
SEDOV K R *36289
SEILER W 35939
SEINFELD J H 36430
SEIZINGER D E *35701
SEIZLER D R *36403
SEKI K 35971
SEKIGUCHI H 35637
SELAMOGLU S *36197
SELKER A P 35619
SENIN V N 35774
SENIOR K B 35707
SENJU H 35868
SENSHU T *36071
SERGEJEV A M 36259
SERNA J D L *36016
SETSER D W 36210
SEVERS R K *35997
SEWELL J R 35813
SEWELL P R 35493
SHABAD L M *35702
SHACKLETTE H T *36371
SHAIR F H 35948
SHAMAH E *35703
SHAW G E *35878
SHAW H *35754
SHAW R W 36032
SHCHERBITSKAYA Z YA 36289
SHEARER S D 36451
SHIBATA H 36272
SHIBATA T 36389
SHIBAZAKI S 36272
SHIBUKAWA S 36369, *36372, *36373
SHIBUTA N 36368
SHIGEMATSU N 36281
SHIGEMORI N 35958
SHIKATA H *36072
SHILMAN A *35818
SHIMADA I *35704
SHIMADA Y 35999
SHIMANUKI K 35469, *36073
SHIMIZU T *36290
SHIMOGATA S 36048
SHIMOHARA K 35958
SHIMOMURA T 35751
SHIMOUCHI H 36297
SHINOZAKI Y 35999
SHINTANI K 35889
SHIOMI M T *36113
SHIOZAWA K *36074
SHIRAGA K 36253, 36254
SHIRAHI T 36281
SHIRAI S 35984
SHIRASAWA T *35501, *35705
SHIRATORI K 36360
SHIRLEY E C *35528, *36098
SHIRVAIKAR V V 36030
SHISHIDO M *36291
SHLIEN D J *36135
SHUGAEV V A *36232
SIAMWALL P S 36284
SIEGEL R *36099
SIEMER D *35819, *35879
SIES W *35706
SIEVERING H *35931
SIKADA N 35868
SIKSNA R *36020
SILOVA M V 36259
SILVERS J H 36168
SIMMONDS P G 35942
SIMON C 36110
SINCLAIR C *36409
SINGH A N *35502
SINGH H J 36133
SINGHANIA G K *36398
SIRS J A *36233
SITARAMAN V *36030
SIVAK G I 35766
SKARE I *35880, *35918
SLOB W H *36075
SMALL J R 35829
SMITH F B *36100, *36101
SMITH H R 35804
SMITT J K L 35644
SMUTEK M *35820
SMYTHE R J *35503
SOLOMON R L 35575
SOLTAU J P *35707
SOLTIS C W *35708
SOLYANIK S K 35468
SOMJEN G G *36234
SOO S L *36211
SOTOKAWA Y *36399
SOUTHWORTH D *35447
SPAENKUCH D 36109
SPARKS C J JR *35881
SPARKS L E 36039
SPARLING R C 35530
SPENCER F E JR *36181
SPINART J *35709
SPINDT R S *36198
SPITZ A W *35781
SPRINGER G S 36185
SRIBNER N G *35541
STAHLFELD D L 35565
STAIRS G R 36355
STANDLER R B *36326
STANEK E J II 36419
STANIEC M 36225
STARA J F *36235, 36278
STARKMAN E S 35556, *35771
STATNICK R M 35658
STAUDINGER H 36224
STAUFFER D 36159
STECHKINA I B 36129
STEIGER H 36315
STEINER M 36285
STEINER P 36285
STEINER SKREB D 35906
STELFOX D *36492
STEMMER E A 36215
STENHOUSE J I T *35594
STEPHENSON M J 35675
STEPNICZKA H *35448
STERNLING C V *36136, 36189
STERNOFF D R *35547
STEVENS R K *35821
STOCKMAN R F *35710
STOKINGER H E *36420
STOLFA F 35773
STOPINSKI O W *36422
STRAKEY J P JR 35441
STRANGE F M *35558
STRAUBEL H 36191
STRELOW R *36441, *36442
STRICKLER S J *36137
STRIGUNOK F I 35468
SUEDA A 35481, 35482
SUETA S 35958
SUGAI R 35870, 36368
SUGAWARA K 36048
SUGIMAE A *35882
SUGIMOTO M 35652
SUGIOKA M [illegible]5711
SUGITA K 36291
SUHR N H 36331
SUMI K 35449
SUMIYOSHI K 36466
SUMMERTON J E 36155, 36262
SUNDARESAN B B 35945
SUPER A B *36031
SUSA I 36042
SUTTERFIELD F D 35952
SUTUGIN A G 36205
SUYAMA H 36466
SUZANNE P 35916
SUZUKI M *36400
SUZUKI R *35504
SUZUKI S *35595, 36171
SUZUKI T 35494, *35596, 35972
SWAN E P 35516
SWANSON E S 36382
SWARTZ D B *35883, 36128
SYROTA J *35712
SZALKAI G 35514
SZEPESI D J *36076
SZPONAR L *36292
SZULC KUBERSKA J *36327

T

TABE Z 36401
TACHIKAWA K 35474
TAGUCHI K 35961, 36077, 36375
TAGUCHI S 36230
TAHARA Y 35474, 36466
TAIRA T 35975
TAJIMA N 35961
TAJIMA T 35975
TAKADA N 36002
TAKAHASHI I 35999
TAKAHASHI K 36047
TAKAHASHI M 36047
TAKAHASHI N 35715
TAKAHASHI T 35843, *36077, 36277, *36443
TAKAHASHI Y 36287
TAKASAKI S *35597
TAKASAKI T 36360, 36361, 36381
TAKATSUKA M 35984
TAKEDA K 35500
TAKEMOTO K *36293
TAKEMOTO T 36462
TAKETANI S 35474
TAKEUCHI H 35500
TAMJIDI F 36155
TAMORI I 35850
TAMPLIN A R *36484
TANAKA A *35884
TANAKA H 35862
TANAKA S *35755, 36357
TANI M 35474, 35655, 36462
TANIYAMA T *36374
TANNER R L 35813
TANO S 35651
TARASOVA L N 35891
TARKINGTON B 36221
TASAKA H 35749
TASSA R 36161
TATEISNI R 36324
TATSUKAWA R *35885
TATSUMI S 35715
TATSUMI T 35964
TATSUNO K 35958
TAUBEN S F *35772
TAYLOER G J 35995
TAYLOR C F 35553
TELLER A *36497
TERABE M *35886, *35887
TERAI K 35954
TERAI S *36401
TERNISIEN J 36417
THERIAULT G P *36236
THOMPSON T H *35756
THOMSON W W *36382, *36387
TILLERY M I *36182
TING I P 36350
TJOA G H *35713
TODAVCHICH Z I *35505

TOKUHIRO T 36085
TOLGKAJA M S 36259
TOMB T F 35566
TOMINGAS V R *36294
TOMIYAGA Y *36375
TOMIZAWA T *35888
TONNA G 36204
TONO S *35598
TOUZ J *35714
TOYAMA S 36172
TRAIN R *36472
TRAIN R E *36415, *36444, *36445, *36446, *36447, *36448, *36449, *36473
TRATTNER R B 35443
TRIMM D L 36212
TRUBNIKOV D N *36183
TRUFFERT L 36012
TSANG W 36152, *36184
TSUCHIDA K 35976
TSUCHIDA T 36466
TSUCHIYA S *36295
TSUCHIYA Y *35449
TSUGENO H *35715
TSUJI M *35889
TSUNETOSHI Y 36290
TSUNODA F *35998
TSUNODA Y 36471
TSURITANI T *35716
TSURUTA H 35748
TSUZIBAYASHI Y 35749
TUER T W *36185
TURMAN B N *36199
TURNER J H 35620
TUROVTSEVA L S 36034
TVERKOVKIN B YE 36173
TWISS S 35826, 35995
TYDINGS J D *36485
TYMEN G 35814

U

UCHIYAMA M *35999
UDAGAWA M *36000
UDAGAWA O 36361, 36381
UDO R 35864
UHLIG C A *36404
UHLMANN E 35699
ULLRICH V 36224
UMEHARA K *35890
UMEZAWA T *36296
UNGER E 36109
UNO H 35990
UNSWORTH M H *36078
URANO K *35506
URUSHIYAMA Y 35870

V

VACATKO Z *35717
VADAS Z 35735
VAIDYANATHAN A *36186
VALBERG P A 36218
VALITOV N KH 35766
VALLANCE J 36349
VAN DUINEN K 35754
VAN ECK O J 35623
VAN GIESSEL R 35687
VAN GRIEKEN R E 35867
VAN HOOK R I 35455
VAN VALIN C C 36027
VAN WYCK D 36225
VAN WYLEN G 35557
VANCINI C A 35560
VANIN A F *36383
VARGA G M JR 35490
VASUDEVAN M S *36207
VAUGHAN W P *35542
VAUGHN D J *36419
VAUGHN W W 35549
VELDS C A *36079, *36102
VELKOFF H R 36193
VERKAMP F J 35589
VESELOV V V *36200
VESSERON P 35686
VETTIG K 35702
VIGLA D 36159
VIKESLAND J P 36137
VILAND C K *35718
VILETTO J JR 35526, *36402
VILLALOBOS R *35719
VINOGRADOV G I 36251
VISKANTA R 36035
VISSY K 35953
VOELSKOW P *35720
VOLKOV S A *35891
VOLSY R *35757
VONNEGUT B 36326
VOSSEN G H V D 36080

W

WAGNER J C *36328
WAGNER M *35721
WAGNER T O 35703
WAID D E *35599
WAKAE H 35964
WAKAMATSU S *36001
WAKAYU M 35962
WAKIMOTO T 35885
WALKENHORST W *35758
WALKER G G 35945
WALL S 35826
WALLER R E 36274
WALSH J R *35759
WALTER G 36191
WALTHER H 35815
WANDS R C *36333
WANG C H T 35666
WARASHINA M 35973
WARDELL J L 36123
WARRICK A W 35587, *35600
WARSHAUER D 36221
WARSI Z U A *36138
WARTENA L *36080
WARWICK M E 35571
WATANABE H 35889, *36002, *36297
WATANABE S *36298
WATANABE T 35509, *35722, 35848
WATERS M D *36299
WATFA M 36146
WATKINS C H *35773
WATSON G M *36513
WATSON W D JR 36403
WAYLAND B B *36187
WEBB J 36227
WECHSLER A E 36092
WEGER E 36464
WEISE A H 35563
WEINBERG W H *36188
WEINSTEIN L H 36306
WELLER W 36309
WENDT J O L 36136, *36189
WERTHEIMER H P 35665
WESOLOWSKI J J 35836
WESTERBERG E N *35507
WESTFIELD W T *35529
WETTIG K 36282
WHELPDALE D M *36032
WHITBY K T 35810
WHITMIRE C E 36323
WHITTINGTON E L 35631
WIESMANN U *36201
WILHELM F C 35569
WILK I J *36486
WILLIAMS C *36347
WILLIAMS I 35867
WILLIAMS R E O 35941
WILLIAMS R G 35648
WILLIAMSON J A JR *35919
WILLSON R 36050
WILSON J H 35765
WILVERT W A 35736
WINCHESTER J W 35867
WINDLE D A 35899
WINGER J G *35530
WINNEKE G 35522, 36318
WOFSY S C 36025
WOLFERMANN H F *36081
WOLK R H 35692
WONG E W 35995
WONG WOO H 35995
WOOD F G *36504
WOODRIFF R 35819, 35879
WU M S *35601
WU T *36190
WYCZALEK F A *35723

Y

YABUKI K *36376
YAGI Y 36043, 36045, *36082, 36470
YAGYU H 35935
YAJIMA T 36507
YAKOVLEV V A 35677
YAMADA K *36083
YAMADA Y 35982, 36166
YAMAKAWA K 35470, 35471, 35967
YAMAMOTO A 35655
YAMAMOTO K 35964
YAMAMOTO M 35907
YAMAMOTO S *36084
YAMAMOTO T 36062
YAMAMOTO Y 36393
YAMANE Y *36003
YAMAOKA S 35839
YAMASAKI M 35477, 35663
YAMATE N *36004, *36510
YAMAZI I 36069
YANAGIDA M 36277
YANAGIHARA S 35704
YANAKA H 35992, 36064
YANAKA T 36368
YANCHENKO YE L 36202
YANG S F *36300
YAO M 36363
YASUDA K 35660
YASUI S 35875, 35994
YATABE T *35892
YAWATA H 36352
YEAGER D W *36301
YELISEYEVA A F 35895
YEREMINA V A 35677
YODA H 35681
YOKOTO B 36287
YOKOYAMA E 36264, 36298
YOKOYAMA O 36084
YONEDA A 36043, 36045, 36082, 36470
YORDANOV D L 36108
YOSHIDA F *36377
YOSHIDA H 36063, 36083
YOSHIDA K *35893, 36054
YOSHIDA R 36295
YOSHIDA T 35971
YOSHIDA Y 35479, 36373, 36466
YOSHIKAWA A *36085
YOSHIKAWA S 36154
YOSHIMI S *36302

YOSHIMURA K 35961
YOSHINARI H 35976
YOSHIOKA N 35630
YOSHIZUMI K *35508, *35509, 35722
YOUNG A R 36261
YOUNG F C *35894
YOUNGQUIST G R 36186
YUDILEVICH M M *35895
YUI N 35991
YUILL C H *36237
YUMOTO S 35477
YUR EVA L M 35745
YUTANI S *36086
YY *35724

Z

ZAJAC Z 36245
ZARKOWER A 36226, *36329
ZAROMB S *35896
ZAYTSEV V A *35774
ZEEDIJK H B *36303
ZHURAVLEV D M 35677
ZIELHUIS R L *36238
ZLATKIS A 35942
ZOLLER W H 36017
ZOLOTAREVSKIY L S 36176
ZRALY A J 35530
ZUBTSOVA S A 36173
ZUNG J T 35601

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58302	58303	58304	58305	58306	58307	58308	58309	58310	58311	58312	58313	58314	
58315	58316	58317	58318	58319	58320	58322	58323	58324	58325	58326	58327	58328	58329
58330	58331	58332	58333	58334	58335	58336	58337	58338	58339	58340	58341	58342	58343
58344	58345	58346	58347	58348	58349	58350	58351	58352	58353	58354	58355	58356	58357
58358	58359	58360	58361	58362	58363	58364	58365	58366	58367	58368	58369	58371	58372
58373	58374	58375	58376	58377	58378	58379	58380	58381	58382	58383	58384	58385	58386
58387	58388	58389	58390	58391	58393	58394	58395	58396	58397	58399	58400	58401	58402
58403	58405	58406	58407	58408	58409	58410	58411	58412	58413	58414	58415	58416	58417
58418	58419	58420	58421	58422	58423	58424	58425	58426	58427	58428	58429	58430	58431
58432	58433	58434	58435	58436	58437	58438	58439	58440	58441	58442	58443	58444	58448
58450	58451	58452	58453	58454	58455	58456	58457	58458	58459	58460	58461	58462	58463
58464	58465	58466	58467	58468	58469	58470	58471	58472	58473	58474	58475	58476	58477
58478	58479	58480	58481	58482	58483	58484	58485	58486	58487	58488	58489	58490	58491
58492	58493	58494	58495	58496	58497	58498	58499	58500	58501	58502	58503	58504	58505
58506	58507	58508	58509	58510	58511	58513	58514	58515	58517	58518	58519	58520	58521
58522	58523	58524	58525	58526	58527	58528	58529	58530	58531	58533	58534	58535	58536
58537	58538	58539	58540	58541	58542	58543	58544	58546	58547	58548	58549	58550	58551
58552	58553	58554	58555	58556	58558	58559	58560	58561	58562	58563	58564	58565	58567
58568	58569	58570	58571	58572	58573	58574	58576	58577	58578	58580	58581	58582	58583
58584	58585	58586	58587	58588	58589	58590	58591	58592	58593	58594	58595	58596	58597
58598	58599	58600	58601	58602	58603	58604	58605	58606	58607	58608	58609	58611	58612
58613	58614	58615	58616	58617	58618	58619	58620	58621	58622	58623	58624	58625	58626
58627	58628	58629	58630	58631	58632	58633	58634	58635	58636	58637	58638	58639	58640
58641	58642	58643	58644	58645	58646	58647	58648	58649	58650	58651	58652	58653	58654

58655	58656	58657	58658	58659	58660	58661	58663	58664	58665	58666	58667	58668	58669
58670	58671	58672	58673	58674	58675	58676	58677	58678	58679	58680	58681	58682	58683
58684	58685	58686	58687	58688	58689	58690	58691	58692	58693	58694	58695	58696	58698
58699	58700	58701	58702	58703	58704	58705	58706	58707	58708	58709	58710	58711	58712
58713	58714	58715	58716	58718	58719	58720	58721	58722	58723	58724	58725	58726	58727
58728	58729	58730	58731	58732	58733	58734	58735	58736	58737	58738	58739	58740	58741
58742	58743	58744	58745	58747	58748	58749	58750	58752	58754	58755	58756	58757	58758
58759	58760	58761	58762	58764	58765	58766	58767	58768	58769	58770	58771	58772	58773
58774	58775	58776	58777	58779	58780	58781	58782	58783	58785	58786	58787	58788	58789
58790	58791	58792	58793	58794	58795	58796	58797	58798	58799	58800	58802	58803	58804
58805	58806	58807	58808	58809	58810	58811	58812	58813	58814	58815	58816	58817	58818
58819	58820	58821	58822	58823	58824	58825	58826	58827	58828	58829	58831	58832	58833
58834	58835	58836	58837	58838	58839	58840	58841	58842	58843	58844	58845	58846	58847
58848	58849	58850	58851	58852	58853	58854	58855	58856	58857	58858	58859	58860	58861
58862	58863	58864	58865	58866	58868	58869	58870	58871	58872	58873	58874	58875	58877
58879	58880	58881	58882	58883	58884	58885	58886	58887	58888	58889	58890	58891	58892
58893	58894	58895	58896	58897	58898	58899	58900	58901	58902	58903	58905	58906	58907
58908	58909	58910	58911	58912	58913	58914	58915	58916	58917	58919	58920	58921	58922
58923	58924	58925	58926	58927	58928	58929	58930	58931	58932	58933	58934	58935	58937
58938	58939	58940	58941	58942	58943	58944	58945	58946	58947	58948	58949	58950	58951
58952	58953	58954	58955	58956	58957	58958	58959	58960	58961	58962	58963	58964	58965
58966	58967	58968	58969	58970	58971	58972	58973	58974	58976	58977	58978	58979	58980
58981	58982	58983	58984	58985	58986	58987	58988	58989	58990	58991	58992	58993	58994
58995	58996	58997	58998	58999	59000	59001	59002	59003	59004	59005	59006	59007	59008
59009	59010	59011	59012	59013	59014	59015	59016	59017	59018	59019	59020	59021	59022
59023	59024	59025	59026	59027	59028	59029	59030	59031	59032	59033	59034	59035	59036
59037	59038	59039	59040	59041	59042	59043	59044	59045	59046	59047	59048	59049	59050
59052	59053	59054	59055	59056	59057	59058	59059	59060	59061	59063	59064	59065	59066
59067	59068	59069	59070	59071	59072	59073	59074	59075	59076	59077	59078	59079	59080
59081	59082	59083	59084	59085	59086	59087	59088	59089	59090	59091	59092	59093	59094
59095	59096	59097	59098	59099	59100	59101	59102	59103	59104	59105	59107	59108	59109
59110	59111	59112	59113	59114	59115	59116	59117	59118	59119	59120	59121	59122	59123
59124	59125	59126	59127	59128	59129	59130	59131	59132	59133	59134	59135	59136	59137
59138	59139	59140	59141	59142	59143	59144	59145	59146	59147	59148	59149	59150	59151
59152	59153	59154	59155	59156	59157	59158	59159	59160	59161	59162	59163	59164	59165
59166	59167	59168	59169	59171	59172	59173	59174	59175	59176	59177	59178	59179	59180
59181	59182	59183	59184	59185	59186	59188	59189	59190	59191	59192	59193	59194	59195
59196	59197	59198	59199	59200	59201	59202	59203	59204	59205	59206	59207	59208	59209
59211	59212	59213	59215	59216	59217	59218	59219	59220	59221	59222	59223	59224	59225
59227	59229	59230	59231	59232	59233	59234	59235	59236	59237	59238	59239	59240	59241
59242	59243	59244	59245	59246	59247	59248	59249	59250	59251	59252	59253	59254	59255
59256	59257	59258	59259	59260	59261	59262	59263	59265	59266	59267	59268	59269	59270
59271	59272	59274	59275	59276	59277	59278	59279	59280	59281	59282	59283	59284	59285
59286	59287	59288	59289	59290	59291	59294	59295	59296	59297	59298	59299	59300	59301
59302	59303	59304	59305	59306	59307	59308	59309	59310	59311	59312	59313	59314	59315
59316	59317	59318	59319	59320	59321	59322	59323	59324	59325	59326	59327	59328	59329
59330	59331	59332	59333	59334	59335	59336	59337	59338	59339	59340	59341	59342	59343
59344	59345	59346	59347	59348	59349	59350	59351	59352	59353	59354	59355	59356	59357
59358	59446	59447	59448	59449	59450	59451	59452	59453	59454	59455	59456	59457	59458
59459	59461	59462	59463	59464	59465	59466	59467	59468	59469	59470	59471	59472	59473
59474	59475	59476	59477	59478	59479	59480	59481	59482	59483	59484	59485	59486	59487
59488	59489	59490	59491	59492	59493	59494	59495	59496	59497	59498	59499	59500	59501
59502	59503	59504	59505	59506	59507	59508	59509	59510	59511	59512	59513	59515	59516

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